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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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VOLUME 22 NUMBER 21/NOVEMBER 8, 1984

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3323

02 AERODYNAMICS 3323

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 3326

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3326

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3327

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 3329

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 3343

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 3343

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 3345

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For related information see also *14 Ground Support Systems and Facilities (Space)*.

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For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 3346

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 3348

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 3349

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 3351

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3352

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 3353

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 3353

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

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23 CHEMISTRY AND MATERIALS (GENERAL) 3355
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3356
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3358
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 3363
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3369
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3372
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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For related information see also *Physics.*

31 ENGINEERING (GENERAL) 3375
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 3381
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3390
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 3397
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 3404
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 3408
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3412
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3415
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3416
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

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For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 3425
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 3433
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 3436
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3437
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 3446
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3451
Includes biological, dynamic and physical oceanography; and marine resources.

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51 LIFE SCIENCES (GENERAL) 3452
Includes genetics.

52 AEROSPACE MEDICINE 3456
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 3459
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3460
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 3461
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 3463
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 3469
Includes computer networks.

63 CYBERNETICS 3470
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 3470
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3474
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3475
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 3475
Includes topology and number theory.

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Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) 3476
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS 3489
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3492
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3497
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3498
Includes light phenomena.

75 PLASMA PHYSICS 3500
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3503
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3507
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) 3507
Includes educational matters.

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Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3516
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3521
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 3522
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3524
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3525
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3526
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3526
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

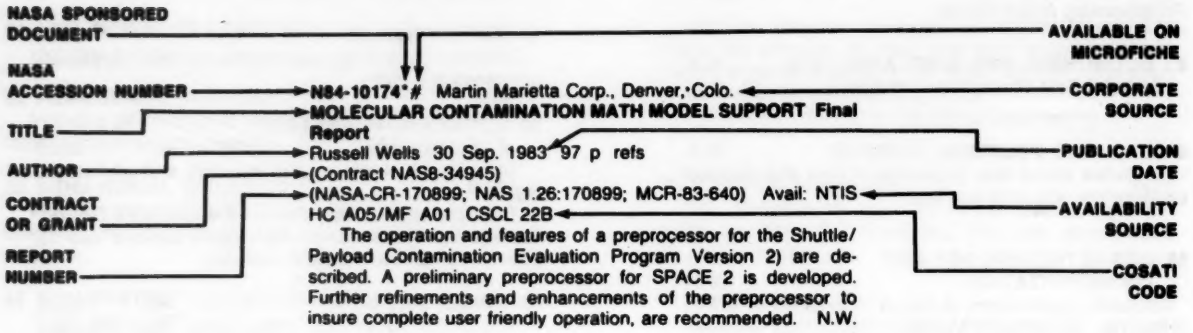
GENERAL

99 GENERAL 3527

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-73
CORPORATE SOURCE INDEX I-83
CONTRACT NUMBER INDEX I-99
REPORT/ACCESSION NUMBER INDEX I-103

TYPICAL CITATION AND ABSTRACT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COSATI CODE
N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 21/NOVEMBER 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-31085# Army Aviation Systems Command, St. Louis, Mo.
HISTORICAL RESEARCH AND DEVELOPMENT INFLATION INDICES FOR ARMY FIXED AND ROTOR WINGED AIRCRAFT
B. M. Barry Mar. 1984 29 p
(AD-A142943; USAAVSCOM-TR-84-F-4) Avail: NTIS HC A03/MF A01 CSCL 05/1

This technical report is a continuation of previous efforts to develop the necessary rationale and methodology needed in order to construct historical inflation indices, in the Research and Development (R/D) area, relative to Army aircraft. The R/D historical indices, and the sub-indices from which they are derived, are presented in the appendices to this report for the period FY68 through FY83. These indices are appropriate for updating statistical reports that formerly utilized the OSD forecasting indices; for initial use in bringing a cost in prior years to a present-year dollar value; and for evaluating inflation actually experienced. A computer program is utilized to make the necessary mathematical calculations. Data sources for this report were the Office of Personnel Management (OPM) and the Bureau of Labor Statistics (BLS). OPM supplied data on government salaries. BLS furnished data on industry salaries and thirteen (13) different materials. The computer program prints the R/D historical inflation indices and sub-indices by fiscal year as shown in Appendices C through G of this report. Author (GRA)

N84-32229# Denver Research Inst., Colo.
ON-LINE TASK ANALYSES IN MAINTENANCE SIMULATION
J. J. Richardson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 39-46 (For primary document see N84-32223 21-81)
(Contract F33615-81-C-0006)
(AD-P003452) Avail: NTIS HC A17/MF A01 CSCL 05/9

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-31086 West Virginia Univ., Morgantown.
STALL DELAY BY BOUNDARY LAYER BLOWING AND/OR SUCTION Ph.D. Thesis
Michael Boasson 1983 221 p
Avail: Univ. Microfilms Order No. DA8407831

High lift can be generated on an airfoil in several ways. One of the mechanically simple ways to do this is to use tangential upper surface blowing. In this work this method is combined with slot suction to find optimum blowing parameters. To keep the analysis independent of a particular geometry, a flat plate is taken as the basic geometry. The adverse pressure gradient of the rear part of an airfoil (behind the point of maximum velocity) is simulated by a source flow. The general transformed boundary layer equations are solved along the plate. The method of solution uses simple finite difference approximations, linearization and an iteration technique. The algebraic equations are solved by the TDMA algorithm. Suction is added through a boundary condition and a wall jet is added by altering the geometry and adding a wall jet velocity profile as an initial condition for the next step. The method is checked against known results and found to have good agreement with them. Turbulence is accounted for using the turbulent eddy viscosity model of Cebeci and Smith. Upstream effect of suction is also investigated and found to be negligible for all but very strong values of suction. Dissert. Abstr.

N84-31087 Stanford Univ., Calif.
COMPUTATION OF INVISCID TRANSONIC FLOW USING FLUX VECTOR SPLITTING IN GENERALIZED COORDINATES Ph.D. Thesis
Pieter George Buninb 1984 178 p
Avail: Univ. Microfilms Order No. DA8408261

In this work, the technique of flux vector splitting is extended to generalized curvilinear coordinates to solve the equations of inviscid, compressible gas dynamics in two dimensions. An implicit finite difference code has been developed which is spatially second-order accurate and fully conservative. The aim of flux vector splitting is to allow the use of one-sided spatial differencing operators by splitting each flux vector into two parts, representing information travelling in the + and coordinate directions. New implicit approximate factorizations are possible with these operators, which are also naturally dissipative. Under a generalized coordinated transformation of the form xi = xi (x,y) and eta = eta (x,y), the flow solution can be computed on a body-conforming grid which simplifies the application of boundary conditions and clustering of grid points to action regions. The issues involved in this extension of flux splitting are covered thoroughly in this paper, including the use of a lower/upper approximate factorization.
Dissert. Abstr.

N84-31088 Ohio State Univ., Columbus.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF ASYMMETRIC TURBULENT SUPERSONIC FREE SHEAR LAYERS Ph.D. Thesis
Endwell Obene Daso 1984 248 p
Avail: Univ. Microfilms Order No. DA8410377

Theoretical and experimental investigations of asymmetric two-dimensional turbulent supersonic free shear layer flows have been undertaken. In the theoretical analysis, the Reynolds stress term was modelled in order to close the equations of motion for numerical solution. Four turbulence models, based on Boussinesq's eddy viscosity concept, were employed. They included a modified Glushko model, a 2nd One-Equation model, a modified Cebeci, Smith and Monsinski model and Prandtl's exchange coefficient

model. The 2nd One-Equation model was newly developed for free shear layer flow calculations. Comparisons with the data of previous experiments generally gave fair agreement with the model predictions. Comparatively, the 2nd One-Equation model showed the best agreement. Also, the theory investigated the effect of Goldstein's singularity on the accuracy of numerical solutions of free shear flows about the trailing edge. Dissert. Abstr.

N84-31089*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTATIONAL AERODYNAMICS AND ARTIFICIAL INTELLIGENCE
Unmeel B. Mehta and Paul Kutler Jun. 1984 40 p refs
(NASA-TM-85994; A-9807; NAS 1.15:85994) Avail: NTIS HC A03/MF A01 CSCL 01A

The general principles of artificial intelligence are reviewed and speculations are made concerning how knowledge based systems can accelerate the process of acquiring new knowledge in aerodynamics, how computational fluid dynamics may use expert systems, and how expert systems may speed the design and development process. In addition, the anatomy of an idealized expert system called AERODYNAMICIST is discussed. Resource requirements for using artificial intelligence in computational fluid dynamics and aerodynamics are examined. Three main conclusions are presented. First, there are two related aspects of computational aerodynamics: reasoning and calculating. Second, a substantial portion of reasoning can be achieved with artificial intelligence. It offers the opportunity of using computers as reasoning machines to set the stage for efficient calculating. Third, expert systems are likely to be new assets of institutions involved in aeronautics for various tasks of computational aerodynamics. M.G.

N84-31090*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT AND APPLICATION OF AN ANALYSIS OF AXISYMMETRIC BODY EFFECTS ON HELICOPTER ROTOR AERODYNAMICS USING MODIFIED SLENDER BODY THEORY
Gloria Yamauchi and Wayne Johnson Jul. 1984 120 p refs
(NASA-TM-85934; A-9704; NAS 1.15:85934) Avail: NTIS HC A06/MF A01 CSCL 01A

A computationally efficient body analysis designed to couple with a comprehensive helicopter analysis is developed in order to calculate the body-induced aerodynamic effects on rotor performance and loads. A modified slender body theory is used as the body model. With the objective of demonstrating the accuracy, efficiency, and application of the method, the analysis at this stage is restricted to axisymmetric bodies at zero angle of attack. By comparing with results from an exact analysis for simple body shapes, it is found that the modified slender body theory provides an accurate potential flow solution for moderately thick bodies, with only a 10%-20% increase in computational effort over that of an isolated rotor analysis. The computational ease of this method provides a means for routine assessment of body-induced effects on a rotor. Results are given for several configurations that typify those being used in the Ames 40- by 80-Foot Wind Tunnel and in the rotor-body aerodynamic interference tests being conducted at Ames. A rotor-hybrid airship configuration is also analyzed. Author

N84-31091*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FEEDBACK IN SEPARATED FLOWS OVER SYMMETRIC AIRFOILS
H. M. Atassi 1984 15 p refs Proposed for presentation at the 9th Aeroacoustics Conf., Williamsburg, Va., 15-17 Oct. 1984; sponsored by the American Inst. of Aeronautics and Astronautics
(NASA-TM-83758; E-2246; NAS 1.15:83758) Avail: NTIS HC A02/MF A01 CSCL 01A

For a flow over an airfoil with laminar separation, a feedback cycle may exist whereby a Kelvin-Helmholtz instability wave emanating from the separation point on the airfoil surface grows along the shear layer and is diffracted as it interacts with the sharp trailing edge of the airfoil, causing acoustic radiation which, in turn, propagates upstream and regenerates the initial instability wave. The analysis is restricted to the high frequency limit. Solutions to the boundary-value problem are obtained using the slowly varying approximation and the method of matched asymptotic expansions. Resonant solutions exist for certain discrete values of the Reynolds and Strouhal numbers. The results are discussed and compared with available data. Author

N84-31092*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNSTEADY TRANSONIC AERODYNAMIC AND AEROELASTIC CALCULATIONS ABOUT AIRFOILS AND WINGS
Peter M. Goorjian and Guru P. Guruswamy (Informatics General Corp., Palo Alto, Calif.) Aug. 1984 34 p refs
(NASA-TM-85986; A-9822; NAS 1.15:85986) Avail: NTIS HC A03/MF A01 CSCL 01A

The development and application of transonic small disturbance codes for computing two dimensional flows, using the code ATRAN2, and for computing three dimensional flows, using the code ATRAN3S, are described. Calculated and experimental results are compared for unsteady flows about airfoils and wings, including several of the cases from the AGARD Standard Aeroelastic Configurations. In two dimensions, the results include AGARD priority cases for the NACA 64A006, NACA 64A010, NACA 0012, and MBB-A3 airfoils. In three dimensions, the results include flows about the F-5 wing, a typical wing, and the AGARD rectangular wings. Viscous corrections are included in some calculations, including those for the AGARD rectangular wing. For several cases, the aerodynamic and aeroelastic calculations are compared with experimental results. M.A.C.

N84-31093*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
POTENTIAL APPLICATION OF ARTIFICIAL CONCEPTS TO AERODYNAMIC SIMULATION
Paul Kutler, Unmeel B. Mehta, and Alison Andrews Jun. 1984 9 p refs
(NASA-TM-85976; A-9798; NAS 1.15:85976) Avail: NTIS HC A02/MF A01 CSCL 01A

The concept of artificial intelligence as it applies to computational fluid dynamics simulation is investigated. How expert systems can be adapted to speed the numerical aerodynamic simulation process is also examined. A proposed expert grid generation system is briefly described which, given flow parameters, configuration geometry, and simulation constraints, uses knowledge about the discretization process to determine grid point coordinates, computational surface information, and zonal interface parameters. M.A.C.

N84-31094*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARISON OF THE FULL POTENTIAL AND EULER FORMULATIONS FOR COMPUTING TRANSONIC AIRFOIL FLOWS
J. Flores, J. Barton, T. Holst, and T. Pulliam Jun. 1984 9 p refs
(NASA-TM-85983; A-9816; NAS 1.15:85983) Avail: NTIS HC A02/MF A01 CSCL 01A

A quantitative comparison between the Euler and full potential formulations with respect to speed and accuracy is presented. The robustness of the codes used is tested by a number of transonic airfoil cases. The computed results are from four transonic airfoil computer codes. The full potential codes use fully implicit iteration algorithms. The first Euler code uses a fully implicit ADI iteration scheme. The second Euler code uses an explicit Runge Kutta time stepping algorithm which is enhanced by a multigrid convergence acceleration scheme. Quantitative comparisons are made using various plots of lift coefficient versus the average mesh spacing along the airfoil. Besides yielding an asymptotic limit to the lift coefficient, these results also demonstrate the truncation error behavior of the various codes. Quantitative conclusions regarding the full potential and Euler formulations with respect to accuracy, speed, and robustness can be presented. M.A.C.

N84-31095*# Thermo Mechanical Systems Co., Canoga Park, Calif.
CALCULATION OF THE 3-D VISCOUS FLOW AT THE ENDWALL LEADING EDGE REGION OF AN AXIAL ANNULAR TURBINE CASCADE Final Report
Leonard Walitt Aug. 1984 77 p refs Sponsored in part by NASA Prepared in cooperation with Army Research and Technology Labs.
(Contract DAAK51-81-C-0047; DA Proj. 1L1-61101-AH-45)
(NASA-CR-168275; NAS 1.26:168275; USAAVSCOM-TR-84-C-3) Avail: NTIS HC A05/MF A01 CSCL 01A

A three-dimensional viscous computer code (VANS/MD) was employed to calculate the turbulent flow field at the end wall leading edge region of a 20 inch axial annular turbine cascade. The initial boundary layer roll-up and formation of the end wall vortices were computed at the vane leading edge. The calculated flow field was found to be periodic with a frequency of approximately 1600 Hz. The calculated size of the separation region for the hub endwall vortex compared favorably with measured endwall oil traces. In an effort to determine the effects of the turbulence model on the calculated unsteadiness, a laminar calculation was made. The periodic nature of the calculated flow field persisted with the frequency essentially unchanged. Author

N84-31096*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC EXCITATION: A PROMISING NEW MEANS OF CONTROLLING SHEAR LAYERS
James R. Stone and Daniel J. McKinzie, Jr. 1984 33 p refs Presented at the ASME Appl. Mech. Div. Summer Meeting, San Antonio, 17-21 Jun. 1984
(NASA-TM-83772; E-2263; NAS 1.15:83772) Avail: NTIS HC A03/MF A01 CSCL 01A

Techniques have long been sought for the controlled modification of turbulent shear layers, such as in jets, wakes, boundary layers, and separated flows. Relatively recently published results of laboratory experiments have established that coherent structures exist within turbulent flows. These results indicate that even apparently chaotic flow fields can contain deterministic, nonrandom elements. Even more recently published results show that deliberate acoustic excitation of these coherent structures has a significant effect on the mixing characteristics of shear layers. Therefore, we have initiated a research effort to develop both an understanding of the interaction mechanisms and the ability to use it to favorably modify various shear layers. Acoustic excitation circumvents the need for pumping significant flow rates, as required by suction or blowing. Control of flows by intentional excitation of natural flow instabilities involves new and largely unexplored phenomena and offers considerable potential for improving component performance. Nonintrusive techniques for flow field control may permit much more efficient, flexible propulsion systems and aircraft designs, including means of stall avoidance and recovery. The techniques developed may also find application in many other areas where mixing is important, such as reactors, continuous lasers, rocket engines, and fluidic devices. It is the objective of this paper to examine some potential applications of the acoustic excitation technique to various shear layer flows of practical aerospace systems. Author

N84-31097*# College of William and Mary, Newport News, Va.
A REVIEW OF SOME REYNOLDS NUMBER EFFECTS RELATED TO BODIES AT HIGH ANGLES OF ATTACK Final Report
Edward C. Polhamus Washington NASA Aug. 1984 125 p refs
(Contract NAG1-261)
(NASA-CR-3809; NAS 1.26:3809) Avail: NTIS HC A06/MF A01 CSCL 01A

A review of some effects of Reynolds number on selected aerodynamic characteristics of two- and three-dimensional bodies of various cross sections in relation to fuselages at high angles of attack at subsonic and transonic speeds is presented. Emphasis is placed on the Reynolds number ranges above the subcritical and angles of attack where lee side vortex flow or unsteady wake type flows predominate. Lists of references, arranged in subject categories, are presented with emphasis on those which include data over a reasonable Reynolds number range. Selected Reynolds number data representative of various aerodynamic flows around bodies are presented and analyzed and some effects of these flows on fuselage aerodynamic parameters are discussed. Author

N84-31098# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SHOCK-FREE TRANSONIC AIRFOIL DESIGN BY A HODOGRAPH METHOD M.S. Thesis - Vermont Univ.
W. Z. Strang 1984 96 p
(AD-A142752; AFIT/CI/NR-84-27T) Avail: NTIS HC A05/MF A01 CSCL 20/4

Refined mathematical methods are required for the analytical solution of the partial differential equation governing steady, two-dimensional, compressible, transonic, potential fluid flow. This equation is nonlinear in the physical plane and so does not lend itself to standard analytical solution methods. The Molenbroek-Chaplygin transformation, where the physical Cartesian coordinates as the independent variables are replaced by the velocity magnitude and direction as the independent variables, linearizes the governing equation which may then be analytically solved. The plane where the said velocity parameters are the independent variables is termed the hodograph plane. Likewise, the transformed differential equation is known as the hodograph equation and it is solved by hodograph methods. This mathematical study addresses the solution of transonic flow phenomena by an extension of Lighthill's hodograph method. Lighthill's method transforms a given solution of the Laplace equation into a solution of the hodograph equation for subsonic flows only. A new relation is developed in this study extending this transformation technique to include flows up to Mach 2.2735 in air. Requiring only numerical data concerning the velocity field, this hodograph method is computationally efficient and mathematically straightforward. GRA

N84-31099# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
INVESTIGATION OF PARAMETERS INFLUENCING THE DEFLECTION OF A THICK WALL JET BY A THIN WALL JET COFLOWING OVER A ROUNDED CORNER Final Report, Jan. 1981 - Jul. 1982
G. G. Huson Dec. 1983 54 p
(AD-A142773; DTNSRDC/ASED-83/10) Avail: NTIS HC A04/MF A01 CSCL 20/4

Recent investigations proved the compatibility of the Circulation Control and the Upper Surface Blowing Concepts. This static investigation is a follow-up to determine what combinations of geometric and pneumatic variables produce an effective deflection of a thick wall jet by a thin wall jet exhausting over a rounded corner. Static pressure distributions over the corner indicate that maximum deflections of the thick wall jet occur when a high average suction is distributed over the surface of the corner. Using a large corner radius, locating the source of the thick wall jet somewhat upstream from the corner and the thin wall jet source, and using a high aspect ratio thick wall jet are geometric means of producing this type of pressure distribution. Author (GRA)

N84-31100# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
EFFECT OF RADIAL LOAD DISTRIBUTION ON THE FIRST-HARMONIC INFLOW VELOCITY OF A HELICOPTER ROTOR AT TRANSITION SPEEDS
H. R. Chaplin Apr. 1984 30 p
(AD-A142840; DTNSRDC/ASED-84/03) Avail: NTIS HC A03/MF A01 CSCL 12/1

A joint Navy/NASA experimental investigation was conducted in October 1983 in the Langley Research Center VSTOL Wind Tunnel to test the hypothesis that helicopters with unusually hub-weighted radial load distributions should experience a more severe first harmonic inflow velocity field during transition than ordinary helicopters. This report presents an approximate analysis of the experimental results. The hypothesis is strongly supported. Compared to the rotor configuration with the most tip-weighted

load distribution, the configuration with the most hub-weighted distribution appears to have experienced an approximately 50 percent greater first-harmonic inflow at a 50 percent greater critical flight speed. Author (GRA)

N84-31101# New York State Dept. of Environmental Conservation, Albany.
TURBULENT DIFFUSION BEHIND VEHICLES: EXPERIMENTS AND VERIFICATION OF ROADWAY MODELS
R. E. Eskridge (Environmental Protection Agency, Research Triangle Park, N.C.), W. B. Petersen (Environmental Protection Agency, Research Triangle Park, N.C.), S. T. Rao, and G. Sistla May 1984 24 p refs
(Grant EPA-R-810475)
(PB84-194273; EPA-600/D-84-141) Avail: NTIS HC A02/MF A01 CSCL 01A

Tracer gas is released behind model vehicles in a moving floor wind tunnel and sampled extensively at various downwind distances. A numerical model is used to test various expressions for the eddy diffusion coefficients. The best formulation is incorporated into the ROADWAY model and it is shown that the current version of the ROADWAY model is an improvement over the earlier version. The predictions of ROADWAY, CALINE3 and HIWAY-2 are compared with the GM Sulfate Dispersion Experiment. It is shown that all three models simulate the GM data very well. GRA

N84-32055# Joint Publications Research Service, Arlington, Va.
FORMATION OF COHERENT STRUCTURES BY ACOUSTICAL EFFECTS IN A TURBULENT WAKE Abstract Only
N. N. Yanenko, S. P. Bardakhanov, and V. V. Koziov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 45-46 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 1, 1984 p 50-53 (For primary document see N84-32043 21-70)
Avail: NTIS HC A06/MF A01

N84-32062# Joint Publications Research Service, Arlington, Va.
HYPERSONIC THREE-DIMENSIONAL FLOW OF RADIATING GAS AROUND WING Abstract Only
A. I. Golubinskiy and V. N. Golubkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 52 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 71-78 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32063# Joint Publications Research Service, Arlington, Va.
HYPERSONIC FLOW OF VISCOUS GAS ON SURFACE OF BLUNT CONE WITH STRONG BLOW-IN IN BLUNTED REGION Abstract Only
Yu. N. Yermak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 53 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 94-101 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32088# Joint Publications Research Service, Arlington, Va.
SUPERSONIC NONSTEADY FLOW PAST FLAT AND AXISYMMETRIC POINTED BODIES Abstract Only
Ye. A. Potekhina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 23-24 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 80-83 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32089# Joint Publications Research Service, Arlington, Va.
SUPERSONIC JET-CAVITY INTERACTION PULSATION Abstract Only
A. I. Kotov and Ye. A. Ugryumov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 24 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 64-68 Original language document previously announced in IAA as A84-25615 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32090# Joint Publications Research Service, Arlington, Va.
DIFFUSION TRANSFER DURING NEAR-SONIC TURBULENCE Abstract Only
A. M. Krugel *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 27-28 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 53, no. 11, Nov. 1983 p 2282-2283 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-31102# Aeronautical Research Labs., Melbourne (Australia).
SIMULATED CRASH DECELERATIONS IN A LIGHT AIRCRAFT CABIN
S. R. Sarrailhe Sep. 1983 42 p
(AD-A142806; AD-E401119; ARL/STRUC NOTE-491) Avail: NTIS HC A03/MF A01 CSCL 01/2

A light aircraft cabin containing a seat and anthropometric dummy was subjected to a vertical deceleration to simulate a minor crash. Several alternative seats were used, all typical of those in light aircraft. The tests showed that with most seats a moderate rate of descent (5 m/s) could produce potentially injurious forces in the spine, but one seat limited the forces to a safe value. Author (GRA)

N84-31103# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.
REPORT TO CONGRESS ON THE EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Semiannual Recurring Report, 1 Jul. - 31 Dec. 1983
13 Apr. 1984 20 p
(AD-A143023; DOT/FAA/ACS-83-2(19)) Avail: NTIS HC A02/MF A01 CSCL 01/2

This report details on the effectiveness of security screening of passengers and all property intended to be carried in the aircraft cabin in air transportation or intrastate air transportation. It also provides a statistical summary of aircraft hijackings and alleged violations of Federal Aviation regulations pertaining to security screening. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-31104*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A ROUTE GENERATOR CONCEPT FOR AIRCRAFT ONBOARD FAULT MONITORING
Michael T. Palmer and Kathy H. Abbott Aug. 1984 33 p refs
(NASA-TM-86264; NAS 1.15:86264) Avail: NTIS HC A03/MF A01 CSCL 17G

Because of the increasingly complex environments in which the flight crews of commercial aviation aircraft must operate, a research effort is currently underway at NASA Langley Research

Center to investigate the potential benefits of intelligent cockpit aids, and to establish guidelines for the application of artificial intelligence techniques to advanced flight management concepts. The segment of this research area that concentrates on automated fault monitoring and diagnosis requires that a reference frame exist, against which the current state of the aircraft may be compared to determine the existence of a fault. This paper describes a computer program which generates the position of that reference frame that specifies the horizontal flight route.
Author

N84-31105*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOFTWARE MODIFICATIONS TO THE DEMONSTRATION ADVANCED AVIONICS SYSTEMS (DAAS)
Bill Nedell and Gordon Hardy Aug. 1984 36 p refs
(NASA-TM-85942; A-9713; NAS 1.15:85942) Avail: NTIS HC A03/MF A01 CSCL 01D

Critical information required for the design of integrated avionics suitable for generation aviation is applied towards software modifications for the Demonstration Advanced Avionics System (DAAS). The program emphasizes the use of data busing, distributed microprocessors, shared electronic displays and data entry devices, and improved functional capability. A demonstration advanced avionics system (DAAS) is designed, built, and flight tested in a Cessna 402, twin engine, general aviation aircraft. Software modifications are made to DAAS at Ames concurrent with the flight test program. The changes are the result of the experience obtained with the system at Ames, and the comments of the pilots who evaluated the system. M.A.C.

N84-31106# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ATTITUDE DETERMINATION USING STRAPDOWN INERTIAL SENSORS AND ADAPTIVE ESTIMATION [DETERMINACAO DE ATITUDE ATRAVES DE SENSORES INERCIAIS ACOPLADOS (STRAPDOWN) E ESTIMACAO ADAPTATIVA]
Nei Cardoso Cardenuto, Atair Rios Neto, and Helio Koiti Kuga Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/50th Congr. Brasileiro de Automatica - 10 CLA/50 CBA, Campina Grande, Brazil, 3-6 Sep. 1984
(INPE-3180-PRE/545) Avail: NTIS HC A02/MF A01

Inertial systems aided by noninertial sensor measurements are often used in remote sensing satellites where the pointing accuracy is critical. The attitude determination is made with optimal filtering using information from inertial sensors (susceptible to nonfatal failures) and from Sun and Earth sensors. An adaptive stochastic is used to process the information from the sensors. The proposed procedure can be used in real time for attitude determination and also for inertial system alignment and off line calibration of the gyrometers. M.A.C.

N84-31107# Engineering and Economics Research, Inc., Vienna, Va.
NATIONAL AIRSPACE REVIEW: IMPLEMENTATION PLAN
Washington Federal Aviation Administration Jun. 1984 51 p refs Sponsored by Federal Aviation Administration
Avail: NTIS HC A04/MF A01

Activities of the National Airspace Review (NAR) are examined. Using a synergistic approach, the NAR is comprehensively reviewing current air traffic control procedures, flight regulations, and airspace for the purpose of validating the current system or identifying near term changes which will promote greater efficiency and provide the operational framework for moving into the next generation National Airspace System. Specifically, purposes of the NAR are: (1) Conduct an in depth study of airspace and procedural aspects of the existing air traffic system. (2) Identify and implement changes that will promote greater efficiency for all airspace users. (3) Simplify the Air Traffic Control system. (4) Match airspace and air traffic control procedures to technological improvement and fuel efficiency programs. M.A.C.

N84-31108# RAND Corp., Santa Monica, Calif.
DISTRIBUTED PROBLEM SOLVING FOR AIR FLEET CONTROL: FRAMEWORK AND IMPLEMENTATIONS Interim Report
R. Steeb, D. McArthur, S. Cammarata, S. Narain, and W. Giarla Apr. 1984 58 p
(Contract MDA903-82-C-0061)
(AD-A143168; RAND/N-2139-ARPA) Avail: NTIS HC A04/MF A01 CSCL 17/7

Distributed problem solving, or multiple-agent problem solving, refers to the process by which several agents interact to achieve goals. In this note, we describe the development of a framework for implementation of multiple cooperative agents. We also describe experiments and demonstrations with different strategies of cooperation, using air-traffic control and remotely piloted vehicle (RPV) fleet coordination as our exemplary task domains. Multi-agent cooperation is discussed first in a domain-independent fashion, and then in the context of the two task domains. We contrast the methodologies, difficulties, and opportunities of distributed and centralized problem solving. From this analysis, we postulate a set of requirements on the information-gathering and organizational policies of group problem-solving agents, and we develop a general framework for implementing such policies. We then discuss a set of distributed problem solvers that we have developed for air-traffic control and surveillance RPV fleet control. Finally, we describe some experimental findings using the cooperative strategies, with particular emphasis on role assignment within the group and communications between group members.
GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-31109 Stanford Univ., Calif.
WING DESIGN FOR MINIMUM DRAG WITH PRACTICAL CONSTRAINTS Ph.D. Thesis
Tad McGeer 1984 239 p
Avail: Univ. Microfilms Order No. DA8408326

General wing design characteristics which offer minimum drag while satisfying practical constraints were discussed including above all a constraint upon structural weight. The essential elements of aerodynamics and structures, when combined with analytical optimization, lead to a series of solutions for lift, chord, and thickness distributions across the span. These provide recipes for selecting a basic wing geometry once a set of parameters and constraints has been specified. Often the results simply endorse present design practice, but by exploring parameter variations we can see some room for improvement. Particularly provocative is the potential of forward swept wings for reducing the induced drag of high subsonic transports despite their aercelastic disadvantages. Dissert. Abstr.

N84-31110 Illinois Univ., Urbana.
FLAPPING-TORSIONAL RESPONSE OF HELICOPTER ROTOR BLADES TO TURBULENCE EXCITATION Ph.D. Thesis
Jon-Shen Fum 1983 166 p
Avail: Univ. Microfilms Order No. DA8409925

Dynamics of a helicopter rotor system in atmospheric turbulence is investigated theoretically. Modeling turbulence components as stationary random processes, differential equations governing the coupled flapping-torsional motion of a rotor blade are derived. The blade is treated as being rigid and centrally hinged for the flapping motion, and as being elastic with a linear deformation mode for the torsional motion. Classical theory is used to formulate the aerodynamic forces due to blade flapping. For those due to blade pitching, a quasi-steady theory is used. The governing equations so obtained contain random turbulence terms in the coefficients and the inhomogeneous parts. By the use of the

stochastic averaging method introduced by Strotonovich, the original physical equations are converted to the Ito equations governing a Markov vector process, which is an approximation for the original physical response state vector. These Ito equations are then used to derive the equations for the statistical moments of the response variables. Dissert. Abstr.

N84-31111*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESULTS OF THE FIRST COMPLETE STATIC CALIBRATION OF THE RSRA ROTOR-LOAD-MEASUREMENT SYSTEM
C. W. Acree, Jr. Aug. 1984 57 p refs
(NASA-TP-2327; A-9593; NAS 1.60:2327) Avail: NTIS HC A04/MF A01 CSCL 01C

The compound Rotor System Research Aircraft (RSRA) is designed to make high-accuracy, simultaneous measurements of all rotor forces and moments in flight. Physical calibration of the rotor force- and moment-measurement system when installed in the aircraft is required to account for known errors and to ensure that measurement-system accuracy is traceable to the National Bureau of Standards. The first static calibration and associated analysis have been completed with good results. Hysteresis was a potential cause of static calibration errors, but was found to be negligible in flight compared to full-scale loads, and analytical methods have been devised to eliminate hysteresis effects on calibration data. Flight tests confirmed that the calibrated rotor-load-measurement system performs as expected in flight and that it can dependably make direct measurements of fuselage vertical drag in hover. Author

N84-31112*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SOFTWARE CONTROL AND SYSTEM CONFIGURATION MANAGEMENT: A SYSTEMS-WIDE APPROACH
Kevin L. Petersen and Christobel Flores, Jr. Aug. 1984 21 p refs Presented at IEEE/AIAA 5th Digital Avionics Systems Conf., Seattle, 31 Oct. - 3 Nov. 1983 Previously announced in IAA as A84-26713 Prepared in cooperation with NASA. Ames Research Center, Moffett Field, Calif.
(NASA-TM-85908; H-1256; NAS 1.15:85908) Avail: NTIS HC A02/MF A01 CSCL 01C

A comprehensive software control and system configuration management process for flight-crucial digital control systems of advanced aircraft has been developed and refined to insure efficient flight system development and safe flight operations. Because of the highly complex interactions among the hardware, software, and system elements of state-of-the-art digital flight control system designs, a systems-wide approach to configuration control and management has been used. Specific procedures are implemented to govern discrepancy reporting and reconciliation, software and hardware change control, systems verification and validation testing, and formal documentation requirements. An active and knowledgeable configuration control board reviews and approves all flight system configuration modifications and revalidation tests. This flexible process has proved effective during the development and flight testing of several research aircraft and remotely piloted research vehicles with digital flight control systems that ranged from relatively simple to highly complex, integrated mechanizations. Author

N84-31113# Aeronautical Research Labs., Melbourne (Australia).
EXTENSIONS AND MODIFICATIONS TO THE ARL POINT-PERFORMANCE PROGRAM
V. A. E. Rouqueirol Sep. 1983 93 p
(AD-A142078; ARL/SYS-TM-67) Avail: NTIS HC A05/MF A01 CSCL 09/2

Several years of usage of the ARL point performance program described in ARL Technical Engineering Report 160 have indicated the desirability of certain improvements and extensions which have been incorporated. This document describes the purpose and nature of the various changes in sufficient detail to allow it to be used independently of the original report.
Author (GRA)

N84-31114# Aeronautical Research Labs., Melbourne (Australia).
FUSELAGE TORSION OF A CT4 AIRCRAFT
P. M. Cox and A. Goldman Dec. 1983 25 p
(AD-A142753; ARL/STRUC-TM-368) Avail: NTIS HC A02/MF A01 CSCL 14/2

The fuselage torsion mode of a CT4 aircraft has been examined using an impulsive testing technique. The modo shape and natural frequency are presented. Author (GRA)

N84-31115# Aeronautical Research Labs., Melbourne (Australia).
CALIBRATION OF CT-4A FATIGUE TEST ARTICLE, MARCH 1983
R. P. Carey and D. G. Ford Jan. 1984 38 p
(AD-A142880; ARL/Struc-TM-373) Avail: NTIS HC A03/MF A01 CSCL 01/3

In preparation for fatigue testing, a strain gauged CT-4A fatigue test article has been calibrated by discrete static loadings. The strain/load data are analyzed herein and strain sensitivities to various load parameters are reported. The responses of some gauges have been compared with flight strains and ground calibrations. Author (GRA)

N84-31116# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Unternehmensbereich Transport- und Verkehrsflugzeuge.
FEASIBILITY STUDY OF A LOW COST ENERGY PERFORMANCE MANAGEMENT SYSTEM (EPMS) Final Report, Jun. 1983
Ralf Bethmann, Wilhem Brennecke, and Franz Boos (Bodenseewerk Geraetetechnik G.m.b.H.) Bonn Bundesministerium fuer Forschung und Technologie May 1983 162 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-015; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34

An Energy Performance Management System (EPMS) for Airbus aircraft is described. In each flight phase the appropriate optimal target values for vertical navigation are indicated to the pilot, relieving him from the task of consulting the performance manual frequently during the flight, and assuring optimal operation of the aircraft under changing conditions. The performance computations consist of algorithms and tabulated data. A proposal for the EPM-Computer is prepared. The integration of the EPMS in the automatic Flight Control System is studied and a Hardware in the Loop Real-Time Simulation established. Author (ESA)

N84-31117# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Unternehmensbereich Transport- und Verkehrsflugzeuge.
UNSTEADY AERODYNAMICS OF FAST MOVING CONTROL SURFACES Final Report, Nov. 1983
Werner Kolander and Hans Hansen Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 79 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-020; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

Active control technology in the unsteady aerodynamics of fast moving surfaces, and systems identification technology are reviewed. Computation programs were developed for the prediction of the unsteady flow about airfoils and wings, with fast control surface movements. Wind tunnel tests with a supercritical airfoil model and two very large halfwing models with fast moving control surfaces, including spoilers, provide the data base for extrapolation to full scale conditions. Author (ESA)

N84-31118# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Laboratoire Central.
MODERN STRUCTURE MATERIALS: PRESENT SITUATION AND EVOLUTION PERSPECTIVES [LES MATERIAUX STRUCTURAUX MODERNES: SITUATION ACTUELLE ET

PERSPECTIVES D'EVOLUTION]
G. Hilaire 1984 60 p In FRENCH Presented at Semaine Aeron. G.I.F.A.S., Madrid, 12-15 Jun. 1984
(SNIAS-841-551-103) Avail: NTIS HC A04/MF A01

The replacement of metals by composites in aircraft construction is noted. Materials selection criteria are reviewed. The composition of civil and military airplanes, helicopters, and engines is discussed. Author (ESA)

N84-31119# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
13 Aug. 1984 50 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-024) Avail: NTIS HC A03/MF A01

Various aspects of transportation in the U.S.S.R. are addressed. Specific topics are: civil aviation, motor vehicles and highways, rail systems, and maritime and river fleets. For individual titles, see N84-31120 through N84-31120.

N84-31120# Joint Publications Research Service, Arlington, Va.
ADVANCED SYSTEM FOR TESTING NEW HELICOPTER TRANSMISSIONS
Geliy Ivanov *In its* USSR Rept.: Transportation (JPRS-UTR-84-024) 13 Aug. 1984 p 3-4 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 19 Jun. 1984 p 4 (For primary document see N84-31119 21-05)
Avail: NTIS HC A03/MF A01

Devices and methods available to test helicopter transmission performance are described briefly. Two test devices, the near full scale stand and the closed mechanical stand, are mentioned. These devices provide mechanical loads to the helicopter transmission. An electromechanical method used in conjunction with a minicomputerized, automated control system is discussed in contrast to the test devices. R.S.F.

N84-31174# British Aerospace Public Ltd. Co., Brough (England). Act Design Group.
ADVANCED COCKPIT-SYSTEMS INTEGRATION
G. Roe *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 695-717 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003569) Avail: NTIS HC A25/MF A01 CSCL 01/3

N84-32087# Joint Publications Research Service, Arlington, Va.
OSCILLATIONS OF ELASTIC AIRPLANE DUE TO WIND GUST Abstract Only
A. V. Ivanova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 23 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-31121# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS PAPERS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE, VOLUME 1 Final Report
C. A. Porubcansky Nov. 1982 582 p Conf. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982
(AD-A142776; ASD(ENA)-TR-82-5031-Vol-1) Avail: NTIS HC A25/MF A01 CSCL 09/3

This is a collection of UNCLASSIFIED papers to be distributed to the attendees to the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. For individual titles, see N84-31122 through N84-31164.

N84-31122# Softech, Inc., Waltham, Mass.
THE EVOLUTION OF THE JOVIAL/J73 LANGUAGE FROM DEFINITION TO USE c61
J. T. Pepe *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 3-9 (For primary document see N84-31121 21-06)
(AD-P003518) Avail: NTIS HC A25/MF A01 CSCL 09/2

The development of a standard programming language is a multi-year effort involving many phases of activity starting with language requirements analysis, leading to language definition, production compilers and programming utilities, and then configuration management of the support software and documentation. After a study of the requirements for a standard Air Force high order language, the JOVIAL/J73 language was defined by MIL-STD-1589A (later superceded by MIL-STD-1589B). Several years of compiler development has resulted in JOVIAL/J73 compilers hosted on three mainframe computers and targeted to several embedded architectures. Because of an embedded computer's limited resources considerable effort has been devoted to compiled object code optimization. The Air Force has sponsored the development of the JOVIAL Compiler Validation System for validating JOVIAL compilers and JOVIAL programming utilities to assist programmers in writing and debugging JOVIAL code. The Language Control Facility has been established to control the definition of JOVIAL/J73, validate compilers and provide support for JOVIAL programmers. Author (GRA)

N84-31123# Proprietary Software, Inc., Los Angeles, Calif.
MANAGEMENT OVERVIEW OF THE BENEFITS OF EFFICIENT JOVIAL J73/1750A SOFTWARE TOOLS c61
J. Fleiss *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 15-18 (For primary document see N84-31121 21-06)
(AD-P003519) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Air Force has invested a significant amount of funds in providing a set of standards for avionics applications. Support software tools for MIL-STD 1750A and MIL-STD 1589B are of critical importance to numerous avionics applications. This article discusses the tools being provided by PSS in support of MIL-STD 1750A and MIL-STD 1589B. Author (GRA)

N84-31124# Software Engineering Associates, Inc., Torrance, Calif.
OBJECT CODE OPTIMIZATION IN A STANDARD COMPILER c60
T. E. Devine *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 39-47 (For primary document see N84-31121 21-06)
(AD-P003520) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper discusses the generation of efficient object code. It covers ongoing work on JOVIAL compilers for various target machines. The cost and maintenance advantages of an optimizer which serves multiple targets are examined. Performance trade-offs with respect to single-target optimizers are considered. The effects of JOVIAL, a military-standard language, and its application on optimizer characteristics are explored. Contrasts are made to optimizers for other languages, such as Pascal and Ada. The difficulties inherent in comparing the quality of compiled code to assembly language are discussed. These difficulties include finding a suitable basis for comparison, determining what is a typical application, and avoiding bias in measurement. Author (GRA)

N84-31125# General Research Corp., Santa Barbara, Calif.
J73AVS: A JOVIAL J73 AUTOMATED VERIFICATION SYSTEM c61

C. Gannon *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 65-84 (For primary document see N84-31121 21-06)
(AD-P003521) Avail: NTIS HC A25/MF A01 CSCL 09/2

The development of J73AVS reflects the commitment of the Air Force to facilitate JOVIAL J73 standardization. This paper describes software verification as it is automated by the J73AVS tool. The concept of software verification is discussed, as well as the capabilities and operation of J73AVS. J73AVS provides much of its payoff by detecting certain software errors and measuring the thoroughness of testing far more accurately and efficiently than could be achieved manually. While J73AVS operates as a standalone program on several host computers, it augments the JOVIAL J73 support environment when used with other Air Force-sponsored tools such as the code auditor debugger and Program Support Library. Author (GRA)

N84-31126# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
JOVIAL LANGUAGE CONTROL PROCEDURES WITH A VIEW TOWARD Ada (TRADEMARK) **c61**
P. A. Knoop and B. R. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 49-63 (For primary document see N84-31121 21-06)
(AD-P003522) Avail: NTIS HC A25/MF A01 CSCL 09/2

JOVIAL is the interim standard language for Air Force avionics embedded computer until Ada becomes available. The JOVIAL Language Control Facility (LCF) has developed and fine-tuned the procedures of language control and defined them using a formal modeling technique. The resulting models promote tight administration of the control function by exposing the details of all tasks and forcing attention to their interrelationships. They also provide a basis for reconfiguring proven Air Force language control functions for Ada, and the LCF has identified some important considerations in accomplishing this. The Air Force's transition to Ada has a high probability of success because of their experience with JOVIAL, their systematic evolution and fine-tuning of language control procedures, and the extensibility of these procedures to encompass Ada. Author (GRA)

N84-31127# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FEASIBILITY ASSESSMENT OF JOVIAL TO Ada (TRADEMARK) TRANSLATION **c61**
D. H. Ehrenfried *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 65-84 (For primary document see N84-31121 21-06)
(AD-P003523) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Ada program is part of a DOD policy change towards incrementally reducing the number of languages in use by the DOD from many to only a few and then eventually to just one; Ada. Currently, MIL-STD-1589B (JOVIAL J73) is the Air Force standard language for use in the embedded application domain. One approach towards an earlier transition of all software written in Ada would be the development of an automatic J73 to Ada translation system. With the translation of all J73 software into Ada, J73 software development systems could be phased out of use, the cost of maintaining the J73 system could be recovered, and programmers would be freed earlier for their eventual transition to Ada. This paper will examine the feasibility and cost effectiveness of developing a J73 to Ada translation system. Author (GRA)

N84-31128# Intermetrics, Inc., Huntington Beach, Calif.
THE MULTIPLE SYSTEM OFP SUPPORT (MSOS) SYSTEM, A PRE-PMRT CAPABILITY FOR EVALUATING TACTICAL SOFTWARE
M. Kirchoff, V. Vajo, and H. Lowery *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 85-92 (For primary document see N84-31121 21-06)
(AD-P003524) Avail: NTIS HC A25/MF A01 CSCL 09/2

A generic software testing facility is presently under development at Warner-Robins Air Logistics Command. The Multiple-System OFP Support System will allow independent verification and validation of avionic software for a variety of systems to be conducted early in the development cycle, reducing costs to the Air Force. Intermetrics, Inc. is linking via hardware and associated software the Nanodata QM-1 microprogrammable computer and the VAX-11/780. The AM-1 hosts emulations of tactical embedded computers and the VAX hosts simulations of real environments. Overlaying the emulation/simulation system in a UNIX-based monitor tailored to provide absolute control and complete visibility into the executing target machine software. A variety of static test tools for analyzing JOVIAL and, eventually, Ada code is being hosted on the VAX. A primary function of these tools will be to verify the conformance of the code to the specific standards. Author (GRA)

N84-31129# General Dynamics Corp., Fort Worth, Tex. Fort Worth Div.
APPLICATION OF JOVIAL (J-73) TO DIGITAL FLIGHT CONTROLS **c08**
J. H. Robb, P. J. Boatman, and P. H. Lang *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 93-100 (For primary document see N84-31121 21-06)
(AD-P003525) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper presents a brief outline of the history of the General Dynamics/Fort Worth Division Production Digital Flight Controls Program. Two flight demonstration programs will be discussed: the single channel digital F-16 and the four channel digital F-16. These were the first flights ever of a microprocessor-based digital fly-by-wire system in a relaxed static stability aircraft. Both demo programs use a pseudo Higher Order Language (HOL) tailored for flight control system applications. This paper describes the techniques used in applying the JOVIAL J-73 HOL to Digital Flight Control System Operational Flight Program (OFP) mechanization. Results are presented from testing the OFP on flight hardware. Included in this paper are JOVIAL J-73 language issues such as subroutine implementation and their associated efficiencies, the test set, and testing methods. Author (GRA)

N84-31130# Air Force Armament Lab., Eglin AFB, Fla.
MIL-STD-1760 DEVELOPMENT PROGRAM
C. M. Connell and B. M. Sundstrom *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 103-107 (For primary document see N84-31121 21-06)
(AD-P003526) Avail: NTIS HC A25/MF A01 CSCL 09/3

The Joint Air Force/Navy program to develop MIL-STD-1760, Aircraft and Store Electrical Interconnection System, is described. The rationale for the program and the program approach and status is presented. Each of the three interface elements of MIL-STD-1760 are discussed with emphasis on how the elements enhance aircraft/store interoperability and reduce future aircraft modification cost. Implementation of MIL-STD-1760 is advocated for all future US and NATO aircraft and stores. Author (GRA)

N84-31131# Vought Corp., Dallas, Tex.
AIRCRAFT-STORE ELECTRICAL INTERCONNECTION SYSTEM (AEIS) FUNCTIONAL REQUIREMENTS **c33**
J. R. Perkins and D. E. Lautner *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 111-122 (For primary document see N84-31121 21-06)
(AD-P003527) Avail: NTIS HC A25/MF A01 CSCL 09/3

This paper provides a summary of the work performed under an A2I2 (Aircraft Armament Interoperable Interface) contract sponsored by the Naval Weapon Center and Air Force Armament Laboratory for developing the aircraft-store electrical functional requirements which will be principally implemented by MIL-STD-1760. The paper provides an overview of the overall requirement drivers and then focuses on three principal electrical areas of the AEIS: The power interface, high bandwidth signaling, and digital data transfer. The paper provides insight on derivation of these requirements and supporting rationale in terms of drivers from existing store requirements, developmental store and technology trends, and traditional engineering approaches. Author (GRA)

N84-31132# Vought Corp., Dallas, Tex.
SIGNAL SET STANDARDIZATION FOR THE AIRCRAFT-STORE ELECTRICAL INTERCONNECTION SYSTEM **c33**
D. E. Lautner and J. R. Perkins *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 123-138 (For primary document see N84-31121 21-06)
(AD-P003528) Avail: NTIS HC A25/MF A01 CSCL 09/3

The Air Force and Navy are conducting a joint program (Aircraft Armament Interoperable Interface A2I2) to standardize interfaces between aircraft and stores. One product of this joint A2I2 program is a military standard for the Aircraft-Store Electrical Interconnection System (AEIS). This standard, released in July 1981 as MIL-STD-1760, defines the electrical interface between aircraft and stores. As mentioned in the MIL-STD-1760 foreword, the complete AEIS is comprised of electrical, logical, and physical elements. The present MIL-STD-1760 issue addresses only the electrical signal set element. This paper provides an overview on the background for the selected MIL-STD-1760 electrical signal set. Following this overview, application restrictions, application guidelines and various technical issues are discussed for each of the power, digital, high bandwidth and discrete signals of MIL-STD-1760. The discussion covers the electrical signal set characteristics presently defined in MIL-STD-1760 plus clarifications and more rigorous definitions of the electrical signal characteristics expected in a future revision to MIL-STD-1760. Author (GRA)

N84-31133# Fairchild Space and Electronics Co., Germantown, Md.
CONSIDERATION OF MIL-STD-1760, AIRCRAFT/STORE ELECTRICAL INTERFACE STANDARD ON STORES MANAGEMENT SYSTEM ARCHITECTURES
J. E. Sill *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 139-159 (For primary document see N84-31121 21-06)
(AD-P003529) Avail: NTIS HC A25/MF A01 CSCL 05/1

Stores Management Systems (SMS) have usually been developed to satisfy point design needs of a particular store suite on particular military aircraft. Typically during aircraft service life the carriage of additional store types, either newly developed or existing, becomes desirable. This frequently requires major surgery to make the aircraft compatible. MIL-STD-1760 is under development to ease that problem at the aircraft/store connection point. Several implications exist for the Stores Management System (which controls that connection point on the aircraft side) if the interoperability objectives of MIL-STD-1760 are to be fully exploited. The analysis presented takes a four step approach to defining an advanced SMS that can provide the interoperability and flexibility desired. First a top-down look into how an SMS fits into an advanced avionics system is presented. The second step is a bottoms-up look into what a multiplicity standard store interfaces imply for the SMS. Third is an analysis of other SMS requirements which must be considered. Finally, an SMS system is projected which can fulfill many of the derived requirements. The flexibility area can be achieved but they require an intergrated analysis which must address mechanical, electrical, and functional compatibility issues for both stores and aircraft. This paper addresses an important part of that analysis, the Stores Management System.
Author (GRA)

N84-31134# Grumman Aerospace Corp., Bethpage, N.Y.
AIRCRAFT MULTIPLEXING SYSTEM ARCHITECTURE AND STORES COMPATIBILITY
A. DeRuggiero and B. Zempolich *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 161-174 (For primary document see N84-31121 21-06)
(AD-P003530) Avail: NTIS HC A25/MF A01 CSCL 09/3

The introduction of more capable and more complex vehicle avionics systems and the emphasis on the aircraft as a holistic system has led to a trend toward distribution of subsystem functions and a greater need to provide effective control over total system operation. Author (GRA)

N84-31135# Army Communications-Electronics Command, Fort Monmouth, N.J.
THE NEBULA AND MCF (MILITARY COMPUTER FAMILY) STANDARDIZATION PROGRAMS **c61**
E. Lieblein *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 177-185 (For primary document see N84-31121 21-06)
(AD-P003531) Avail: NTIS HC A25/MF A01 CSCL 09/2

Military computers are currently employed in defense systems to perform a wide range of functions in the areas of weapon control, command and control, communications, intelligence analysis, navigation, surveillance, target acquisition, sensors, electronic warfare, and combat support services. Over the years, the number of types of computers used in such systems has increased. This proliferation has become a serious problem in that it increases the cost of software development and support, maintenance, training, and the supply pipeline. Further, it impedes competition for technology upgrades and reduces overall battlefield survivability. Recognition by the Department of Defense and the military services of the need to curtail proliferation has resulted in efforts to standardize at various levels: high-order language and its software environment, instruction-set architecture (ISA), and hardware. With regard to the first level, the services are working together to standardize the Ada language. At the second level, the Navy has standardized on the ISA's of the AN/UYK-43 and AN/UYK-44. The Air Force has standardized on the MIL-STD-1750 ISA and both the Army and the Air Force have standardized on the MIL-STD-1862 (Nebula) ISA. Computer hardware standardization, due to different needs, has not extended across service lines. Author (GRA)

N84-31136# Tartan Labs., Inc., Pittsburgh, Pa.
THE NEBULA STANDARD COMPUTER ARCHITECTURE **c60**
W. B. Dietz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 187-205 (For primary document see N84-31121 21-06)
(AD-P003532) Avail: NTIS HC A25/MF A01 CSCL 09/2

Nebula is a standard instruction set architecture designed for embedded military applications. Several new ideas were incorporated in the standard that allow a family of implementations to effectively use advancing technology. In addition to following design principles that allow Nebula to be a good target for high level languages, the designers also adopted a visibility approach in architecture design that provides more freedom for the hardware implementor while still maintaining software portability.
Author (GRA)

N84-31137# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
TRANSPORTABILITY OF NEBULA SOFTWARE **c61**
G. L. Steele, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 207-217 (For primary document see N84-31121 21-06)
(AD-P003533) Avail: NTIS HC A25/MF A01 CSCL 09/2

This article discusses various aspects of the Nebula architecture definition that are purposely implementation-dependent. These might seem at first glance to present obstacles to software portability. These implementation dependencies are intentionally included in the architecture definition to allow implementors the freedom to evolve new implementation strategies and to exploit advancing technology. Portability problems are alleviated by a combination of specification conventions, explicit protection mechanisms in the hardware, and special modules that can be conventionally used to hide implementation details. The result is an architecture definition that allows Nebula software to be compatible across a range of hardware implementations, while enabling more cost-effective hardware realizations by allowing implementors the freedom to explore a variety of implementation techniques. Author (GRA)

N84-31138# RCA Government Systems Div., Moorestown, N. J. Missile and Surface Radar.
THE IMPACT OF NEBULA, MCF (MILITARY COMPUTER FAM-

ILY), AND Ada (TRADEMARK) ON REAL-TIME EMBEDDED COMPUTER SYSTEMS c61
F. E. Wuebker *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 219-224 (For primary document see N84-31121 21-06)
(AD-P003534) Avail: NTIS HC A25/MF A01 CSCL 09/2

The 1862A Instruction Set Architecture (ISA) is resulting in a Nebula - Military Computer Family Data Processing System. This combination will provide a significant improvement in software performances for both unit and distributed-processor real-time systems. The performance gain will be obtained from the short, compact code sequences resulting from the inherent power of the ISA and from the inherent machine speed of the Military Computer Family. This gain obviates the need for any assembly-language programming for real-time applications. Productivity, reliability, and maintainability requirements demand that all future real-time applications be written in a higher order language. Experiments to date show that the Ada-Nebula combination results in the best source code to object code expansion values, hence best performance. Of the higher order languages most suited to real-time performance (FORTRAN, JOVIAL, CMS-2, and Ada), Ada with an Ada-based program design language provides the capability for the highest productivity. Traceability between design and code, using Ada and Ada PDL, and a machine processable documentation methodology will provide the reliability and maintainability desired by the software community. Author (GRA)

N84-31139# Raytheon Co., Sudbury, Mass. Equipment Div.
PAS/NEB: A PASCAL LANGUAGE TOOL FOR THE MCF (MILITARY COMPUTER FAMILY) c61
E. Souren, G. Lonardo, and R. Couranz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 225-237 (For primary document see N84-31121 21-06)
(AD-P003535) Avail: NTIS HC A25/MF A01 CSCL 09/2

The ability to generate structured High Order Language (HOL) code for modern computers is an almost universally accepted requirement. Raytheon, one of the three Army Military Computer Family (MCF) contractors, has responded to this requirement by developing tools allowing the generation of code for MCF in PASCAL. The major features of PASCAL are available to the user including the intermixing of PASCAL and NEBULA modules. This paper describes the general structure of the PASCAL tool and provides examples of how PASCAL has been effectively employed on the Computer Control Panel of the Raytheon MCF Advanced Development Model. Measures of MCF instruction set code generation are presented. Experience to date indicates that PAS/NEB provides an effective HOL tool for programmers while awaiting the availability of MCF ADA. Author (GRA)

N84-31140# Sperry Univac, St. Paul, Minn.
A PROGRAMMABLE BUS CONTROL INTERFACE c61
R. M. Salter *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 241-254 (For primary document see N84-31121 21-06)
(AD-P003536) Avail: NTIS HC A25/MF A01 CSCL 09/2

Many aspects of MIL-STD-1553B design have become routine. Standard transceivers, encoder-decoders and nearly complete interfaces can be purchased. Bus controller and smart RT performance, however, is still evolving as capability beyond mere protocol handling is possible in an I/O module. The Air Force Programmable Interface for Multiplex Systems project created a 1553 embeddable processor on a 6 x 9 module with sufficient power to support multiple dialects of MIL-STD-1553 and operate as an independent processor executing an extensive general purpose instruction set. The conventions established for host-to-channel interface allow the channel to both efficiently execute bus lists and off load exception processing from the host.
Author (GRA)

N84-31141# Grumman Aerospace Corp., Bethpage, N.Y.
SINGLE CHIP MIL-STD-1553B BUS INTERFACE UNIT KEEPS PACE WITH CHIP SETS c33
S. Schaire *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 255-268 (For primary document see N84-31121 21-06)
(AD-P003537) Avail: NTIS HC A25/MF A01 CSCL 09/3

The introduction of chip sets for multiplex terminal designs that provide savings in hardware and software may leave the designer confused as to which chip set to use for a particular application. The Grumman/Standard Microsystem Corp. (SMC) Bus Interface Unit (BIU) is compared to other BIUs in terms of capabilities and amount of peripheral chips required. It is shown that the single-chip Grumman/SMC BIU performs similar functions of the other chip set BIUs at a lower cost. Author (GRA)

N84-31142# Circuit Technology, Inc., Farmingdale, N.Y.
MIL-STD-1553B MARCONI LSI CHIP SET IN A REMOTE TERMINAL APPLICATION c33
A. DiMarino *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 269-275 (For primary document see N84-31121 21-06)
(AD-P003538) Avail: NTIS HC A25/MF A01 CSCL 09/3

Marconi Avionics is utilizing the MIL-STD-1553B LSI Chip Set in the SCADC Air Data Computer application to perform all of the required remote terminal MIL-STD-1553B protocol functions. Basic components of the RTU are the dual redundant chip set, CT3231 Transceivers, 256 x 16 RAM and a Z8002 microprocessor. Basic transfers are to/from the RAM command of the bus controller or Z8002 processor. During transfers from the processor to the RAM, the chip set busy bit is set for a period not exceeding 250 microseconds. When the transfer is complete, the busy bit is released and transfers to the data bus occur on command. The LSI Chip Set word count lines are used to locate each data word in the local memory and 4 mode codes are used in the application: reset remote terminal, transmit status word, transmitter shut-down, and override transmitter shutdown. Author (GRA)

N84-31143# ILC Data Device Corp., Bohemia, N.Y.
MIL-STD-1553 INTERFACE APPLICATION NOTES c33
S. N. Friedman *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 277-294 (For primary document see N84-31121 21-06)
(AD-P003539) Avail: NTIS HC A25/MF A01 CSCL 09/3

This paper describes Monolithic and Hybrid circuits used for interfacing to a MIL-STD-1553 Multiplex Data Bus. The focus in on how to implement smart and dumb remote terminals with existing devices. A menu table depicting product selection has also been provided. The implementation of Bus Controller (BC), Monitor and Remote Terminal Unit (RTU) interfaces, will be fully described using standard off the shelf products. Buffered Memory Interface, will complete the picture of the implementation of MIL-STD-1553 A or B. The MCE (Smith) LSI Chip Set for MIL-STD-1553B RTU and BC configurations will be described. Additional application topics covered will be the implementation of high speed data transfer circuitry, single, dual and quad redundant channel operation as well as implementing external status word controls. A summary of product sizes and power requirements associated with Bus Controller, RTU and Monitor applications will be provided.
Author (GRA)

N84-31144# General Dynamics Corp., San Diego, Calif.
APPLICATION OF 1553B TO MRASM (MEDIUM RANGE AIR TO SURFACE MISSILE): A SYSTEMS LOOK c15
J. E. Leib *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 295-304 (For primary document see N84-31121 21-06)
(AD-P003540) Avail: NTIS HC A25/MF A01 CSCL 09/3

MRASM (Medium Range Air to Surface Missile) is the first missile to incorporate a MIL-STD-1553B data bus as the primary means of data transfer among the elements of the missile. The standard, built around applications which could dedicate major computing power to manage the affairs of the data bus, posed a challenge to MRASM because this bus management function needed to be performed on the input/output card which fit in an existing computer design, while not utilizing its host computer on a continuing basis. This paper reviews the process by which the

data bus operation was defined, describes the protocol adopted for timely transfer of data, and argues the case for the system design decisions. Author (GRA)

N84-31145# General Dynamics Corp., San Diego, Calif.
MIL-STD-1553B IN MRASM (MEDIUM RANGE AIR TO SURFACE MISSILE): THE DESIGNER'S CHALLENGE **c15**
V. L. Elmore *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 305-313 (For primary document see N84-31121 21-06)
(AD-P003541) Avail: NTIS HC A25/MF A01 CSCL 05/1

Unique design challenges are created when incorporating MIL-STD-1553B into a low cost tactical missile system. The designer is challenged by the requirement to minimize host computer interaction with bus events, while utilizing off-the-shelf-components on a single 5.8 inch x 4.8 inch printed circuit card. Further demands are imposed by the requirement to integrate the triple functions of bus controller, remote terminal, and monitor terminal into a single design. This paper addresses one set of solutions to these and related problems. The paper will also review the process by which the card was designed, and the solutions to the general challenges faced in any 1553B implementation. Author (GRA)

N84-31146# Marconi Avionics Ltd., Rochester (England).
THIRD GENERATION MIL-STD-1553B LSI CHIP SET **c33**
R. D. Beasley *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 315-325 (For primary document see N84-31121 21-06)
(AD-P003542) Avail: NTIS HC A25/MF A01 CSCL 09/3

Marconi Avionics Limited's experience with MIL-STD-1553 commenced with the implementation of an a standard remote terminal in the Head Up Display for the General Dynamics F16 by our Airborne Displays Division. The Flight Automation Research Laboratory (FARL) has subsequently completed a circuit design for the digital section of a MIL-STD-1553B terminal with the LSI implementation carried out by Marconi Electronic Devices Ltd. These LSI devices are currently available through Circuit Technology Inc. of New York. This paper will review the current LSI terminal activity undertaken by FARL. This activity has used experience gained during the previous five-element 1553B LSI development as the foundation for a third generation two-element 1553 LSI terminal design. The subsequent semiconductor implementation is a collaborative exercise between the GEC Hirst Research Centre and FARL. Author (GRA)

N84-31147# Naval Avionics Center, Indianapolis, Ind.
DATA WORD STANDARDIZATION **c82**
F. E. Peter *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 327-336 (For primary document see N84-31121 21-06)
(AD-P003543) Avail: NTIS HC A25/MF A01 CSCL 09/4

Two defense contractors, Boeing and Semcor, have proposed standard data word formats for use with MIL-STD-1553 systems. These proposed formats differ in that the Boeing proposal is based on the historical usage of English units while the Semcor proposal is based on a conversion to metric units. At the request of the Tri-Service Multiplex Committee, the SAE/A-2K Subcommittee for Multiplexing has formed a Data Word Standardization Task Group to revise Chapter 11, Data Word and Message Format Guidelines for publication in the Multiplex Applications Handbook. Chapter 11 will contain both English and metric units to allow industry an orderly conversion to metric units while providing an unofficial standard for English units. The Task Group has revised the Boeing draft Chapter 11 with the following major changes: an improved ICD format, modified data formating rules, a simplified procedure for developing nonstandard data words, and a detailed review of the data word formats. Chapter 11 will be submitted to the SAE/AE-9 (formerly A-2K) Subcommittee at the fall 1982 meeting. Development of an all metric MIL-STD for data words within the next two years will be recommended. Author (GRA)

N84-31148# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-STD-1553B VALIDATION TESTING **c33**
D. J. Thorpe and K. V. Vakkalanka *In its* Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 337-347 (For primary document see N84-31121 21-06)
(AD-P003544) Avail: NTIS HC A25/MF A01 CSCL 09/3

One of the major responsibilities of the Systems Engineering Avionics Facility (SEAFAC) is to act as the Air Force Office of Primary Responsibility (OPR) for MIL-STD-1553 applications. Since its inception in 1974, this organization played a vital role in promoting and enforcing the standard. In the area testing, SEAFAC set the pace by developing the Test Plan and specialized test equipment. Our advanced validation test facility allows us to test a wide variety of MIL-STD-1553B interfaces, such as Remote Terminals, transceivers and, of particular interest, the Large Scale Integrated circuit chips, to ensure their conformity to MIL-STD-1553B. This paper outlines our present validation testing as well as planned automation of our test facility. A summary of our experiences is presented. The paper concludes with SEAFAC's role in future testing. Author (GRA)

N84-31149# Test Systems, Inc., Phoenix, Ariz.
MIL-STD-1553: TESTING AND TEST EQUIPMENT **c35**
L. Earhart *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 349-365 (For primary document see N84-31121 21-06)
(AD-P003545) Avail: NTIS HC A25/MF A01 CSCL 14/2

In the last few years there has been significant increase in the application of MIL-STD-1553. This has generated the need for better understanding of all apsects of testing multiplex hardware and systems. This paper begins with a brief discussion of the philosophy of testing. It highlights the compromise involved in end-item testing. The various phases of the test requirements are necessary to verify compliance with MIL-STD-1553B. The functional requirements of special purpose test equipment for multiplex hardware are described. The paper ends with an overview of commercially available MIL-STD-1553 test equipment. Author (GRA)

N84-31150# General Dynamics Corp., Fort Worth, Tex.
A COMMON 1553B I/O CHANNEL FOR THE F-16
S. Alford *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 367-382 (For primary document see N84-31121 21-06)
(AD-P003546) Avail: NTIS HC A25/MF A01 CSCL 09/3

The 1980's will see increased standardization in military avionics. MIL-STD-1553 has proven to be an effective means of assuring communications among independently developed avionic subsystems. Future applications of the Air Force standard computer architecture, MIL-STD-1750A, and standard programming language, MIL-STD-1589B, will further decrease the life cycle costs of many systems currently under development. While MIL-STD-1750A defines a specific CPU architecture, and MIL-STD-1553B defines the method of communication among subsystems, no current Air Force standard defines the I/O channel that links the 1750 processor to the 1553 bus. In order to reduce both the cost of software development and maintenance, General Dynamics has developed a 1553 channel architecture to be applied to all the subsystems being programmed in-house for the F-16 Multi-National Staged Improvement Program (MSIP). Author (GRA)

N84-31151# Boeing Co., Seattle, Wash.
MIL-STD-1750A USERS GROUP **c60**
C. R. Turner and M. L. Wagner *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 385-394 (For primary document see N84-31121 21-06)
(AD-P003547) Avail: NTIS HC A25/MF A01 CSCL 05/1

The MIL-STD-1750 Users Group was established in August 1979 as a voluntary organization of industry representative to exchange information and status of MIL-STD-1750, and to recommend changes to the standard. This paper is a brief description of the Group, its committees accomplishments, and

future direction. The purpose of the standard is reviewed. MIL-STD-1750 is a standard for an instruction set architecture ISA. GRA

N84-31152# Fairchild Camera and Instrument Corp., Palo Alto, Calif. Advanced Research and Development Lab.

MIL-STD-1750A MICROPROCESSOR CHIP SET DEVELOPMENT **c60**

T. A. Longo and D. Wilnai *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 395-404 (For primary document see N84-31121 21-06)

(AD-P003548) Avail: NTIS HC A25/MF A01 CSCL 05/1

Fairchild ARDL, under contract with General Dynamics/Fort Worth, is developing a high performance MIL-STD-1750A microprocessor chip set for use in embedded computer applications in U.S. Air Force avionic systems. This paper describes the development program, the design methodology and the process technology. Fairchild MIL-STD-1750A Microprocessor chip set is centered around the F9450A a 20-MHz 64 pin microprocessor with 200ns cycle time that implements all 1750A instructions including floating point. Two support devices under development are the F9451, a 1750A Memory Management Unit, and the F9452, a 1750A Block Protect RAM device. In addition to the microprocessor chip set, Fairchild is developing an Engineering Test and Evaluation Equipment based on the FS-1 Microprocessor Development system. The paper discusses current trends in processing technologies and their effects on system performance. Author (GRA)

N84-31153# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

A HIGH PERFORMANCE MIL-STD-1750A MICROPROCESSOR **c60**

T. L. Rasset and J. H. Lane *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 405-411 (For primary document see N84-31121 21-06)

(AD-P003549) Avail: NTIS HC A25/MF A01 CSCL 09/2

As part of a continuing research and development program in embedded computer systems, McDonnell Douglas Corporation (MDC) is developing a high-speed MIL-STD-1750A microprocessor. The central processing unit consists of three integrated circuits, which together from a 1750A processor is capable of performing the DAIS instruction mix at greater than 900 KIPS. The technology used in the 1750A microprocessor is a mature complementary metal oxide semiconductor/silicon on sapphire (CMOS/SOS) process in use at MDC. This is a radiation-tolerant, low-power, high-speed technology that makes is possible to achieve the processor's high throughput while consuming less than 2 watts of power. This paper describes the architecture of the processor and the user-oriented approach taken in the development of the processor and its support tool. Author (GRA)

N84-31154# Rolm Corp., San Jose, Calif. MIL-SPEC Computer Div.

A MIL-STD-1750A COMPUTER EMPLOYING THE MDAC (MCDONNELL DOUGLAS ASTRONAUTICS CORPORATION) CMOS-SOS CHIPSET **c60**

C. F. Frank, Jr. and L. W. Speelman *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 413-427 (For primary document see N84-31121 21-06)

(AD-P003550) Avail: NTIS HC A25/MF A01 CSCL 09/2

The need for higher performance, low power, radiation tolerant, MIL-STD-1750A computers for single card up to full ATR configurations is satisfied by ROLM Corporation through application of the McDonnell Douglas Astronautics Corporation CMOS-SOS Model 281 Chipset. Combining this chipset with the standard ROLM bus on an AN/UYK-19 type card permits 1750 insertion into a wide variety of computing applications for new or retrofit programs. Government and prime contractors are provided access to standard catalog products where projects must employ 1750A processors with associated memory, I/O, and Mux Bus components without incurring large engineering expenses for these elements. This allows 1750A processor use from the initial stages of any 16 BIT computer based system. Design trade off factors of emulator, remicrocoded mini, and chipset approaches are presented along with typical card set and system application. Author (GRA)

N84-31155# Mikros Systems Corp., Mercerville, N.J.

A NEW SILICON-ON-SAPPHIRE MIL-STD-1750A MICROPROCESSOR **c60**

J. R. Burns, H. Silcock, G. Portanova, and S. Nicholas *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 429-444 (For primary document see N84-31121 21-06)

(AD-P003551) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper describes the MKS1750, a new implementation of the United States Air Force MIL-STD-1750A architecture fabricated entirely in SOS/CMOS technology. The MKS1750 is a chip set based on a proprietary microprogrammable 16-bit microprocessor (the MKS16) supported by additional logic implemented as semi-custom gate arrays and ROMs for control store. A total of eleven chips is required. Power consumption of the MKS1750 is less than 1W and throughput is greater than 200 KIPS, measured using the USAF DAIS mix. A complete description of the chip set is given, including the architecture of the MKS16, gate array partitioning and the functional specification of each array. The paper also discusses the structure of the MKS1750 microprogram, available software support and packaging considerations. Author (GRA)

N84-31156# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.

THE USE OF COMPUTER ISA (INSTRUCTION SET ARCHITECTURES) AND SOFTWARE STANDARDS AT WESTINGHOUSE DEFENSE ELECTRONICS CENTER **c60**

M. A. Geyer, J. G. Gregory, and H. R. Moran, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 447-456 (For primary document see N84-31121 21-06)

(AD-P003552) Avail: NTIS HC A25/MF A01 CSCL 09/2

MIL-STD-1750A is the fourth generation of computer hardware standards that have been embraced at Westinghouse since the early 1960's. The use of standards has had many advantages: rapidly maturing support software and hardware; a large pool of software engineers that can readily move from one program to another; lower recurring and non-recurring costs; less lead time on programs; similar or identical software benches for different programs. MIL-STD-1750A is presently utilized as an embedded computer on three major programs and has been proposed on several others. Author (GRA)

N84-31157# Tracor, Inc., Austin, Tex. Aerospace Group.

TRANSPORTABLE GPU (GENERAL PROCESSOR UNITS) CHIP SET TECHNOLOGY FOR STANDARD COMPUTER ARCHITECTURES **c33**

R. E. Fosdick and H. C. Denison *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 457-477 (For primary document see N84-31121 21-06)

(AD-P003553) Avail: NTIS HC A25/MF A01 CSCL 09/3

The USAFR-developed GPU Chip Set has been utilized by Tracor to implement both USAF and Navy Standard 16-Bit Airborne Computer Architectures. Both configurations are currently being delivered into DOD full-scale development programs. Leadless Hermetic Chip Carrier packaging has facilitated implementation of both architectures on single 41/2 x 5 substrates. The CMOS and CMOS/SOS implementations of the GPU Chip Set have allowed both CPU implementations to use less than 3 watts of power each. Recent efforts by Tracor for USAF have included the definition of a next-generation GPU Chip Set that will retain the application-proven architecture of the current chip set while offering the added cost advantages of transportability across ISO-CMOS and CMOS/SOS processes and across numerous semiconductor manufacturers using a newly-defined set of common design rules. The Enhanced GPU Chip Set will increase speed by an approximate factor of 3 while significantly reducing chip counts and costs of standard CPU implementations. Author (GRA)

N84-31158# Aerospace Corp., Los Angeles, Calif.
MIL-STD-1750A AS A SPACEBORNE INSTRUCTION SET ARCHITECTURE **c60**
R. N. Constant, R. C. Fleming, E. M. Garcia, M. Lubofsky, and D. R. OBell *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 479-491 (For primary document see N84-31121 21-06)
(AD-P003554) Avail: NTIS HC A25/MF A01 CSCL 09/2

A study was undertaken to examine the issues involved in establishing instruction set architecture (ISA) standards for computers used in embedded spaceborne applications on Air Force Space Division projects. The specific areas addressed were: (1) Space Division requirements and ISA tradeoffs, (2) comparisons of military standard and commercial spaceborne ISAs, (3) an LSI implementation study, and (4) an LSI cost study. The bottom line of the study is that the MIL-STD-1750A ISA addresses the onboard processing needs of all present and near term Space Division projects as well as many of those on far term projects. In addition, the development of space qualified 1750A computers should be a low risk project with relatively modest costs once the efforts currently sponsored by other agencies are successfully completed. Author (GRA)

N84-31159# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-STD-1750A VERIFICATION TESTING **c61**
L. E. Velez *In its* Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 493-499 (For primary document see N84-31121 21-06)
(AD-P003555) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper describes reasons for and importance of verifying that a computer correctly implements MIL-STD-1750A architectural specifications. It includes a brief summary of verification history. It describes present methodology for verification testing including test procedures, results analysis, and test reporting. Finally, a future approach for verification testing is discussed. Author (GRA)

N84-31160# RCA Government Systems Div., Moorestown, N. J. Missile and Surface Radar.
Ada (TRADEMARK) AS A PROGRAM DESIGN LANGUAGE. A RATIONAL APPROACH TO TRANSITIONING INDUSTRY TO THE WORLD OF Ada THROUGH A PROGRAM DESIGN LANGUAGE CRITERIA **c61**
R. M. Blasewitz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 509-513 (For primary document see N84-31121 21-06)
(AD-P003556) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Department of Defense requirements to use the higher order language Ada by the mid-1980s will create challenges to developers of military software that encompass two major concerns: developing a core of Ada software personnel, and achieving productivity and software quality gains that have been targeted as Ada life cycle objectives. Because of recent government direction to use Ada-based PDLs, many organizations are developing prototype Ada-based design methods. The IEEE working group on Ada as a PDL is working on guidelines for the use of Ada-based design languages. The guidelines will include recommendations reflecting the current state of the art as well as alternative approaches in order to preserve good practice. The extent of industry's involvement with Ada PDLs, and also the status of the IEEE guidelines, may substantially impact both the acceptance of the Ada language and the efficiency of its use. Author (GRA)

N84-31161# Naval Ocean Systems Center, San Diego, Calif.
THE KAPSE (KERNEL Ada (TRADEMARK) PROGRAMMING SUPPORT ENVIRONMENT) INTERFACE TEAM **c61**
P. A. Oberndorf *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 519-532 (For primary document see N84-31121 21-06)
(AD-P003557) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Kernel Ada Programming Support Environment (KAPSE) Interface Team (KIT) was established by the Ada Joint Program Office to address the issues involved in sharing Ada support tools among APSEs. The goal is to establish interface standards which will assure the transportability of tools and data bases between APSEs. The KIT and its auxiliary team, the KAPSE Interface Team from Industry and Academia, have been meeting since early 1982. The paper discusses their progress to date, the plans for the future and the major issues confronting them in achieving this major goal of the Ada program. Author (GRA)

N84-31162# Sperry Univac, St. Paul, Minn. Defense Systems Div.
THE Ada (TRADEMARK) RUN-TIME ENVIRONMENT **c61**
J. K. Cross *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 533-538 (For primary document see N84-31121 21-06)
(AD-P003558) Avail: NTIS HC A25/MF A01 CSCL 09/2

The requirements on an Ada run-time environment are surprisingly few and straightforward. The free choices left up to the implementors of a run-time environment are many and significant. These requirements and freedoms are enumerated and discussed, and the importance of these issues to the success of an Ada software system is described. Author (GRA)

N84-31163# Marconi Avionics Ltd., Boreham Wood (England).
A CODE OF PRACTICE TO CONSTRAIN Ada (TRADEMARK) **c61**
T. G. Swann *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 541-542 (For primary document see N84-31121 21-06)
(AD-P003559) Avail: NTIS HC A25/MF A01 CSCL 09/2

SCOPE is more than just a code of practice for software development, it is the way we work in Marconi Avionics. Whatever project, whatever language, SCOPE enables us to maintain a house-style and a level of visibility and transportability across all our software. But the scale and complexity of Ada introduce a new dimension. It will be difficult to ensure a similarity of style within a project team, let alone across the breadth of the company. And while Ada encourages good practices, it cannot prevent vices. We must extend our code of practice. But to keep it simple we propose to integrate SCOPE with the Ada manuals to show not only what can be done, but what should be done, from choosing a language construct to setting up a project database. For the price of a manual we achieve a standard. Author (GRA)

N84-31164# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CONSIDERATIONS **c61**
C. L. Braun *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 545-559 (For primary document see N84-31121 21-06)
(Contract DAAK80-81-C-0187)
(AD-P003560) Avail: NTIS HC A25/MF A01 CSCL 05/9

The government has instituted the Ada program with the objective of reducing its rapidly-increasing software development costs. Ada will do this by providing programmers with modern capabilities that have been demonstrated to promote more cost-effective software development. Clearly, the government's objective can be met only if programmers actually learn to use these capabilities effectively. This requires significant change from the way they are used to working, and poses a massive retraining requirement. SofTech has been working with the U.S. Army to assess the training needs of various segments of the industry and government work forces, to identify training issues and effective techniques for addressing them, and to recommend a training approach. This effort has resulted in development of a complete recommended Ada curriculum. The curriculum provides training in the Ada language, the environment, and modern development methodologies. It consists of a set of modular building blocks that can be configured to meet varying individual or organizational needs, adapted to different organizations' practices, and packaged to meet scheduling needs. This approach answers many of the difficult questions that have been asked about Ada training, and presents a realistic roadmap to widespread industry competence in Ada. Author (GRA)

N84-31165# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS PAPERS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE, VOLUME 2 Final Report
C. A. Porubcansky, ed. Nov. 1982 596 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982
(AD-A142777; ASD(ENA)-TR-82-5031-Vol-2) Avail: NTIS HC A25/MF A01 CSCL 09/3

This is a collection of UNCLASSIFIED papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the Conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. For individual titles, see N84-31166 through N84-31200.

N84-31166# Martin Marietta Aerospace, Orlando, Fla.
STANDARDS AND INTEGRATED AVIONIC DIGITAL SYSTEM ARCHITECTURE c60
E. L. Griffin *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 563-581 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003561) Avail: NTIS HC A25/MF A01 CSCL 09/2

Integrated digital system design and development of the hardware, software, and interfaces that integrate the avionic flight control, fire control, and man-machine display and control must emphasize the man-rated weapon system's availability and survivability. The scope of tasks including detailed trade studies such as CMOS/SOS versus ECL semiconductor use, and parallel pipelining versus multi-microprocessor architecture usually requires an engineering team with backgrounds from requirements and integration, electronics hardware, packaging, and software. System attributes of fault tolerance, fail safe, and fail soft operation requires total team adherence to a set of design, documentation, implementation, and test standards of which few have complete familiarity. Since use of these standards has prevented costly errors and overruns in procurement, and decreased maintenance costs over the life cycle, this paper shows how to make each effective contributor on the team understand the standards controlling performance and product specifications, change and configuration control, test planning, and test procedure generation for the other areas of expertise. Author (GRA)

N84-31167# Boeing Military Airplane Development, Seattle, Wash.
ACHIEVING THE BENEFITS OF MODULAR AVIONICS DESIGN
S. W. Behnen, F. M. Lightfoot, and P. R. Metz *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 583-595 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003562) Avail: NTIS HC A25/MF A01 CSCL 05/1

New system development programs are adopting the principles of modular design to reduce the number of unique parts, increase capability, improve fault tolerance, lower costs, and encourage transition to new technologies. Programs such as Integrated Communication, Navigation, Identification Avionics are proving the value of this approach. Even greater benefits will be obtained from modular design, however, when the use of common modules spreads across, and into, dissimilar subsystems. The creation and adoption of new military standards, which will complement existing standards, are needed to encourage widespread use of compatible modular avionics. Examples are given, as well as suggestions as to the most efficient way of circumventing inherent industry reluctance to adopt national standards. Author (GRA)

N84-31168# IBM Federal Systems Div., Owego, N. Y.
STANDARD ISAs (INSTRUCTION SET ARCHITECTURES) AND VLSI (VERY LARGE SCALE INTEGRATION): TWO INTERACTING TRENDS c60
P. M. Kogge *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 597-609 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003563) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper provides some practical observations regarding the relationship between DOD standard Instruction Set Architectures (ISAs) and Very Large Scale Integration (VLSI). Relevant properties of current ISAs and available VLSI technology are noted. Projections are made on how VLSI may be used to implement these ISAs over the near term. Some problem areas that tend to limit the applicability of today's VLSI under certain circumstances are also addressed. The final subject is the possibility of new ISA standards in the future: why this might become desirable and how such future ISAs may, or should, be influenced by a desire to take advantage of the full potential of VLSI. Author (GRA)

N84-31169# Naval Avionics Center, Indianapolis, Ind.
NAVY PACKAGING STANDARDIZATION THRUSTS c33
J. R. Kidwell *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 617-632 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003564) Avail: NTIS HC A25/MF A01 CSCL 09/3

Standardization is a concept that is basic to our world today. The idea of reducing costs through the economics of mass production is an easy one to grasp. Henry Ford started the process of large scale standardization in this country with the Detroit production lines for his automobiles. In the process additional benefits accrued, such as improved reliability through design maturity, off-the-shelf repair parts, faster repair time, and a resultant lower cost of ownership (lower life-cycle cost). The need to attain standardization benefits with military equipments exists now. Defense budgets, although recently increased, are not going to permit us to continue the tremendous investment required to maintain even the status quo and develop new hardware at the same time. Needed are more reliable, maintainable, testable hardware in the Fleet. It is imperative to recognize the obsolescence problems created by the use of high technology devices in our equipments, and find ways to combat these shortfalls. The Navy has two packaging standardization programs that will be addressed in this paper; the Standard Electronic Modules and the Modular Avionics Packaging programs. Following a brief overview of the salient features of each program, the packaging technology aspects of the program will be addressed, and developmental areas currently being investigated will be identified. Author (GRA)

N84-31170# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AN INTRODUCTION TO THE AVIONICS INTEGRITY PROGRAM
J. E. Verdier *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 633-637 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003565) Avail: NTIS HC A25/MF A01 CSCL 09/3

This paper describes the Avionics Integrity Program which will develop a MIL-STD and an implementation handbook for the development and operation of avionics systems. The objectives of the program are to reduce the cost of ownership and increase availability while meeting user requirements. The basic approach is presented and the outline of the MIL-STD and handbook are explained. Author (GRA)

N84-31171# General Dynamics/Fort Worth, Tex.
ELEMENTS FOR SUCCESSFUL IMPLEMENTATION OF COMPUTING STANDARDS
G. R. England *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 643-653 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003566) Avail: NTIS HC A25/MF A01 CSCL 09/3

The F-16 avionics implements what is likely the broadest

application of standards of any USAF weapon system. Standards available in 1976 were applied which consisted of the MIL-STD-1553 Multiplex Data Bus, JOVIAL J3B which was the defacto software HOL and precursor to JOVIAL J73 dialect and the MIL-STD-483/490 software documentation standard. These standards were instrumental in making the F-16 a very successful program. The F-16 avionic system is now being greatly expanded to accommodate advanced sensors and weapons currently in USAF funded development. Once again the F-16 is at the forefront in implementing the latest USAF standards. A key feature of the enhanced avionics is the application of JOVIAL J73 (MIL-STD-1589B) for all subsystem, the MIL-STD-1553B Multiplex Data Bus, the MIL-STD-1750A Computer Instruction Set Architecture and the MIL-STD-1760 Stores Interface. This paper describes the implementation of standards in both the current and the enhanced F-16 avionics. Author (GRA)

N84-31172# Teledyne Systems Co., Northridge, Calif.
THE APPLICATION OF STANDARDS TO THE TDY-750 (TIGERSHARK) MISSION COMPUTER c60
D. W. Geyer *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 659-674 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003567) Avail: NTIS HC A25/MF A01 CSCL 09/3

The design objective of the Teledyne TDY-750 computer series was to be completely compliant with the three Air Force Standards applying to aircraft mission computers: MIL-STD-1750A, MIL-STD-1553B, and MIL-STD-1589B (JOVIAL J73). A secondary design objective was to build a machine substantially lighter and faster than its competition while using standard discrete parts available from multiple sources. All objectives were met and, on 8/31/82, the first production prototype machine completed acceptance testing ahead of schedule. The 15 pound machine includes 64K memory, housing, power supply, and a microprogrammable 1553B Bus Controller/Remote Terminal. Formal SEAFAC testing to Change Notice 1 was successfully completed 8/25/82. A powerful software development system, including a real time JOVIAL Symbolic Debugger, complete the total hardware/software system. Author (GRA)

N84-31173# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
PAVE PILLAR: A MATURATION PROCESS FOR AN ADVANCED AVIONICS ARCHITECTURE
D. R. Morgan and R. D. Bellem *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 675-690 Proc. held in Dayton, Ohio, 30 Dec. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003568) Avail: NTIS HC A25/MF A01 CSCL 09/2

Recent speed and density advancements in microelectronics will now permit the development of powerful and affordable avionic architectural elements - viz. processing, memories and wide band data buses. An advanced architecture making use of these elements and coupled with highly flexible software, will enhance the capability to fully exploit information integration and automation processes. An abundance of real-time data is available for integration from diverse subsystems aboard advanced military aircraft. Dramatic improvements in avionic system availability, crew workload reduction, weapon system survivability and supportability are possible using this approach. The introduction of these system integration technologies into the force structure is needed at the earliest opportunity to meet expanding mission requirements. However, care must be exercised to ensure that concepts and standards have been matured through validation testing to avoid potentially costly mistakes. The Air Force has establishd the PAVE PILLAR Program to provide the needed maturation of advanced avionic system architectural approaches, system elements and potential system standards during advanced development. This Program also initiates the concept of establishing system integration technology as a separate discipline within the Laboratory framework. This paper describes the PAVE PILLAR Program being pursued within the Avionics Laboratory of the Wright Aeronautical Laboratories. Enhancements to operational force effectiveness resulting from system integration will be described, along with advanced system technology elements and potential standards which will be developed and demonstrated. Author (GRA)

N84-31174# British Aerospace Public Ltd. Co., Brough (England). Act Design Group.
ADVANCED COCKPIT-SYSTEMS INTEGRATION c05
G. Roe *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 695-717 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003569) Avail: NTIS HC A25/MF A01 CSCL 01/3

The present paper describes two major complementary activities funded by the United Kingdom Ministry of Defense which are being undertaken at the Brough site of British Aerospace. These studies are addressing the problem of pilots task optimization and the overall system architecture needed to meet the operational requirements of the next tactical combat aircraft. These activities are the Advanced Cockpit Design Studies and the Tactical Combat Aircraft Avionic Demonstrator Rig. The Advanced Cockpit Studies have been underway for some 6 years. The scope of these studies has been extensive, covering escape system design, g' alleviation techniques, advance pilot and equipment cooling techniques, information and control task rationalization and the development of workload prediction and measurement techniques. The studies have, after a number of iterations, culminated in the development of a dynamic cockpit mockup. The studies specifically related to the information and control task rationalization will be discussed in this paper in some detail. The Tactical Combat Aircraft Avionic Demonstrator Rig is presently at the mid point of a 3-4 year evolutionary design program investigating such topics as, total system integration, standardization of interfaces, effective subsystem inter communication, graceful degradation of the system and improved maintenance procedures. The architecture being developed has a multi bus hierarchy and implements the data transmission standard 1553B for sub system to sub system and bus to bus communications. GRA

N84-31175# IBM Federal Systems Div., Bethesda, Md.
DEFENSE INDUSTRY ATTITUDES ABOUT AF INTERFACE STANDARDS REPORT OF AN ELECTRONICS INDUSTRIES ASSOCIATION SURVEY c60
P. N. Pocalyko and C. E. Swallow, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 721-727 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003570) Avail: NTIS HC A25/MF A01 CSCL 09/3

Major General Welch USAF, Asst. Deputy Chief of Staff for Research, Development and Acquisition, has asked the Electronic Industries Association for policy level participation in the Air Force's avionics standards program. This paper reports on the initial step of the response of industry. It analyzes a survey made under the sponsorship of the EIA. Defense industry managers and senior engineers experienced in the development and production of mission-critical avionics and software were questioned about their experiences and opinions concerning the Air Force standards for J-73 (JOVIAL), Ada, 1553 Data Bus, and 1750 Instruction Set Architecture. The responses are cross-correlated with experience levels and nature of the respondent's field of expertise. Results are presented as a summary of current attitudes which can serve as data base for focusing issues for further discussion with industry. Author (GRA)

N84-31176# Battelle Columbus Labs., Ohio.
DIGITAL AVIONICS DESIGN FOR VALIDATION
E. F. Hitt *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 729-749 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003571) Avail: NTIS HC A25/MF A01 CSCL 09/3

The designer/developer of fault tolerant avionics must consider the requirements to validate these digital systems. These require-

ments should be primary factors influencing the design and hence the sustainability of these systems. This paper presents a synopsis of a methodology of design and validation of digital avionics and flight control systems based upon early consideration of validation requirements. Avionics developed using this methodology will provide real time fault detection and isolation and hence reduce aircraft down time due to avionics failures. Changes in mission requirements will be reflected in the need to modify or add software modules throughout the system's life cycle. This necessitates design and control of hardware and software interfaces in order to keep the time required to validate the change to a minimum and speed retrofit of the modification in the operational units.
Author (GRA)

N84-31177# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
WESTINGHOUSE USES USAF-DEVELOPED STANDARDS c33
C. S. Shyman *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 753-765 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003572) Avail: NTIS HC A25/MF A01 CSCL 09/3

Westinghouse has applied digital standards advantageously for the U.S. Air Force on its latest weapon systems. At present Westinghouse is applying MIL-STD-1750A (ISA), MIL-STD-1589B (JOVIAL 73 HOL), and MIL-STD-1553B (multiplex busing) to three major programs: B-1B Offensive Radar System, Improved AN/APG-66 Radar for the F-16, and AFTI F-16 Electro-Optical Sensor/ Tracker. Westinghouse has gone one step further than the digital standards. With U.S. Air Force encouragement Westinghouse has a program for maximum radar commonality among the B-1B ORS, F-16C, and the U.S. Army Sgt. York DIVAD Gun System. This paper will cover Westinghouse's approach toward managing the application of the military standards across multiple programs with different prime contractors and services. Additionally, the method by which configuration control of standard module hardware (i.e., rational standardization) maintained at Westinghouse will be discussed.
Author (GRA)

N84-31178# Rome Air Development Center, Griffiss AFB, N.Y.
A GENERAL PURPOSE COMPUTER ARCHITECTURE INVESTIGATION FACILITY c60
D. W. Gonzalez *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 767-776 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003573) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper discusses a set of hardware and software tools that have been integrated into a general purpose emulation facility. This facility is available across the United States via the ARPAnet. The tools allow users to produce an emulator using a high order programming language, execute the emulator via a remote interface to a Nanodata QMI and execute assembly language software on the emulator. Experiences with the development and use of the facility are discussed. Views on the extension of the facility's capabilities are also discussed.
Author (GRA)

N84-31179# Federal Electric Corp., Vandenberg AFB, Calif.
AN INTEGRATED APPROACH TO A SUCCESSFUL EMBEDDED COMPUTER RESOURCE PROJECT c60
L. G. Egan, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 777-812 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003574) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper describes a number of key milestones and techniques that should be accomplished in order to produce cost effective, embedded computing systems. It stresses the necessity of improved project management to effect an integrated hardware/ software system. Improved project management requires a thorough understanding and implementation of the DOD/MIL standards and specifications. If Program Project Managers from both the government and contractor are knowledgeable in, and motivated to follow, the approved standards/ specifications, embedded computer resources, i.e., equipment, computer programs, personnel, facilities, and logistics, will be provisioned at lower costs and per the requirements allocated to each resource. The paper will emphasize the need for systems engineering, work breakdown structures, the systems development process, documentation milestones, DT&E for hardware/software, and integration leading to system stones, DT&E for hardware/software, and integration leading to system certification. This can only be effective via standards compliance.
Author (GRA)

N84-31180# Army Aviation Center, Fort Rucker, Ala.
CONCEPTS FOR LHX AVIONICS
R. H. Smith *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 815-819 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003575) Avail: NTIS HC A25/MF A01 CSCL 09/3

LHX is the acronym for a family of light, highly capable aircraft intended for operational use in the airland battle well beyond the year 2000. They will be capable of operation in a wide variety of adverse environments on a very hostile battlefield (lasers and other directed energy weapons will be commonplace). Accordingly, the conceptual designs being considered are very different from today's helicopters One major thrust is toward automation of crew duties, with a goal of achieving single pilot operation.
GRA

N84-31181# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-PRIME PROGRAM SYSTEM c31
F. T. Rall, Jr. *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 823-841 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003576) Avail: NTIS HC A25/MF A01 CSCL 05/1

The MIL-PRIME Program was developed to provide the Aeronautical Systems Division with a specifications and standards program for the development of new weapon systems. This program was started in 1976 and is still in the process of being implemented. This presentation provides the background and insight into the MIL PRIME System, the use of these new documents in the acquisition process, and the current status of the program.
Author (GRA)

N84-31182# Marconi Avionics Ltd., Rochester (England).
OPTIONS AND OPPORTUNITIES FOR STANDARDS: A NATO/ AGARD VIEWPOINT c31
J. T. Shepherd and L. J. Urban *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 843-859 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003577) Avail: NTIS HC A25/MF A01 CSCL 09/3

This paper presents a summary of the findings of AGARD Working Group 06. This working group was established to consider Distributed Micro Processor Application to Guidance & Control Systems. The results of this study are presented in AGARD AR-178. One of the areas considered by the working group was option and opportunities for standards and it is this area that is being considered in this paper. It should be emphasized that this document is not intended to suggest definitive standards or even to state categorically that any given standard should be developed. Rather its intention is to focus attention upon the need for standards and to point out areas where opportunities exist for standardization. As will be seen from the previous sections in this report there is a vast proliferation in hardware and software. When systems are developed they often produce unique hardware and software, such as operating systems, executives, high level languages, etc. Since the life cycle of aircraft systems is at least twenty years from conception, it could be as much as thirty years after the initial design before the systems are finally phased out. This makes it almost impossible to maintain avionic systems in the later parts of their life cycle.
Author (GRA)

N84-31183# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

PROPOSED MIL-STD FOR AVIONICS INSTALLATION INTERFACES

G. Schopf *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 861-870 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003578) Avail: NTIS HC A25/MF A01 CSCL 05/1

This paper describes the Military Standard (MIL-STD) now in development for avionics installation interface standardization. Originally based upon the interface standard used by the commercial airlines, this new MIL-STD, now extensively revised, is scheduled for coordination at the end of 1982. The background which led to the development of the standard includes on analysis of the benefits expected to result from its application, the relationship between this standard and other military standards, and the similarities between this standard and the commercial (ARINC 600) standard. The open forum approach, using maximum industry participation, was used extensively over a two-year period to produce the document. The technical highlights of the standard, including weight and power dissipation limits, environmental requirements, and LRU form factors are presented. A new electrical connector, which also serves as a hold-down device, is a key element in the design approach. Air Force plans for implementation of the standard are aimed primarily at new airframes and major avionics updates of existing airframes. Also, those avionics subsystems being developed for multiple airframe application are prime candidates. Author (GRA)

N84-31184*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FIBER OPTICS FOR THE FUTURE - WAVELENGTH DIVISION MULTIPLEXING c74

J. L. Spencer *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 871-888 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003579) Avail: NTIS HC A25/MF A01 CSCL 09C

Optical wavelength division multiplexing (WDM) systems, with signals transmitted on different wavelengths through a single fiber, can have increased information capacity and fault isolation properties over single wavelength optical systems. This paper describes a typical WDM system. The applicability of future standards to such a system are discussed. Also, a state-of-the-art survey of optical multimode components which could be used to implement the system are made. The components to be surveyed are sources, multiplexers, and detectors. Emphasis is given to the demultiplexer techniques which are the major developmental components in the WDM system. Author (GRA)

N84-31185# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

INTEGRATED CNI (COMMUNICATION NAVIGATION AND IDENTIFICATION) AVIONICS AND FUTURE STANDARDIZATION

D. Botha *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 889-897 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003580) Avail: NTIS HC A25/MF A01 CSCL 09/3

The Integrated Communication Navigation and Identification Avionics (ICNIA) project is a system design and validation effort within service laboratories; the system includes the full suite of CNI functions, and is an alternative to a collection of independent C, N, and I system black boxes. The concept is that of a family of modules; front end, preprocessor, signal processor, data processor, clock, COMSEC/TRANSEC, etc. which can be tailored to an individual aircraft type and mission, implying that there could be unique LRUs for each aircraft type. This presents a logistically intolerable situation unless the LRUs, fleetwide, consist almost entirely of standard SRUs of relatively few types across the fleet; standardization at the module, subassembly, or SRU level is required. This paper discusses the system approach to CNI implementation in 1990s procurement, current standards already adopted in the program, and the future standards which appear to be necessary for fullest benefit from the ICNIA concept. Author (GRA)

N84-31186# General Electric Co., Syracuse, N.Y. Undersea Electronics Programs Dept.

ARCHITECTURE, HARDWARE AND SOFTWARE ISSUES IN FIELDING THE NEXT GENERATION DOD PROCESSORS c60

O. Golubjatnikov *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 899-925 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003581) Avail: NTIS HC A25/MF A01 CSCL 09/2

Programmable hardware will be pervasive in DOD mission-critical embedded computer systems exploiting technology advances to meet unsatisfied needs. The embedded processors are absolutely critical in maintaining the superiority of our mission-critical systems and weapons. They provide a major advantage for mission-critical system performance and operational readiness. There are, however, major obstacles to achieving these advantages. Commercial computer architectures and implementations are constrained by market considerations while military computers and custom-designed processors generally lack comprehensive software environments and are deficient in field upgradeability and support and have high life-cycle costs. The proliferation of computer types has aggravated the explosive DOD software cost growth. DOD is providing major processing architecture, hardware and software initiatives for fielding the next generation processors in support of their mission-critical systems to overcome these problems, to contain the explsoive software cost growth and to more fully exploit the computer advantage. The paper examines the major architectural, software and hardware issues associated with the development of the next generation DOD processors. The impact of DOD mission-critical computer (MCC) architecture, hardware, software and policy initiatives on the Army MCF, the Navy TECR and EMSP, and the Air Force MIL-STD-1750 and MIL-STD-1862 processors is explored in a comparative manner. Author (GRA)

N84-31187# Arinc Research Corp., Annapolis, Md.

STANDARD AVIONICS SOFTWARE: THE FUTURE STRATEGY FOR COST-EFFECTIVE AVIONICS c61

E. C. Straub *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 927-945 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003582) Avail: NTIS HC A25/MF A01 CSCL 09/2

This paper reports an ARINC Research Corporation's work in developing and evaluating software acquisition alternatives for the USAF's Multi-Mode Radar program (since renamed the Multi-Role Radar (MRR) Program). Although the paper reflects work accomplished for that program, the approach taken could be used for any software-intensive avionics program where several aircraft are involved and for which most of the software and hardware might be common. The work was sponsored by Air Force Systems Command's Deputy for Reconnaissance and Electronic Warfare, Aeronautical Systems Division (ASD/RW). The paper assesses the applicability of current radar technology and production programs to an MRR; discusses guidance provided by existing and proposed policies, Directives and Standards; examines the operational, cost, schedule, risk, supportability, and management aspects of three software development alternatives and addresses the use of the ASD/ACCX software cost estimating model to analyze software development costs. Software acquisition alternative results are presented. Author (GRA)

N84-31188# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

LANTIRN (LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT) - TOMMORROW'S SOFTWARE DEVELOPMENT TODAY

K. B. Hawks (For primary document see N84-31165 21-06)

(AD-P003583) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Low Altitude Navigation and Targeting Infrared System for Night program is a complex system consisting of a wide field-of-view, holographic Heads-Up Display; a navigation pod featuring a wide field-of-view forward looking infrared (FLIR) and terrain following radar subsystems; and a targeting pod whose initial capability will provide a narrow field-of-view FLIR, a laser designator/ranger, and missile boresight correlation. The airborne computer resources consists of 22 computers and 32 computer programs. LANTIRN is the first truly distributed processing system with autonomous processors developed for aircraft. Additionally, LANTIRN was the first program with JOVIAL J-73, MIL-STD-1750A architecture, and MIL-STD-1553 busses directed upon it. The LANTIRN software development has successfully demonstrated the practicality of language and architecture standardization. Savings in schedule and resources directly resulted from the transportability of code. While there were (and still are) challenges to standardization, LANTIRN has proven its effectiveness on large, complex, state-of-the-art systems. Author (GRA)

N84-31189# General Dynamics/Fort Worth, Tex.

QUANTUM LEAP IN AVIONICS

W. E. Cantrell *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 959-975 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003584) Avail: NTIS HC A25/MF A01 CSCL 09/3

Current standardization levels in such programs as the F-16 are providing benefits of productivity and growth that have been significant in the success of that program. The ever-increasing drive to performance, multi-use systems and diverse weapons has heavily taxed current avionic resources. In addition, the data transfer requirement is complicated by the high speed data flow that modern computers both feed on an produce; by multiple source-multiple destination video distribution requirement; the need to self-test the system to lower levels; and the desire to dynamically reconfigure from a failure. Fortunately, the technology to achieve solutions to these new problems is evolving in the VHSIC and fiber optics programs, so that it is possible to rearchitecture the system at the module level as opposed to the LRU level. Module level standardization around a small number of types allows a large number of system level combinations while achieving economies of scale at the module level. The usual objection to standardization, that it freezes innovation, is avoided by technology transparency provisions; while at the same time the objection that standardization obsoletes the present is avoided by downward compatibility provisions. Candidates for standardization in this approach include bus interfaces, the system network, modules and racks. Author (GRA)

N84-31190# Wright Aeronautical Corp., Paterson, N.J.

STANDARDIZED COMPUTING SYSTEM SDS80 **c60**

J. Olsson *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 979-988 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003585) Avail: NTIS HC A25/MF A01 CSCL 09/2

The Standardized Computing System SDS80 is a complete hardware/software package. Through its modularity and versatility, SDS80 is well suited for various military applications, e.g., in aircraft and command and control centers as well as non-military applications. The main design goal has been the reduction of life cycle costs, especially the cost for software development and maintenance. SDS80 consists of: Computers D80 and D80M (Micro) - High order languages Ada and PASCAL/D80 - Program Development system AIDS (Ada Integrated Development System) and PUS80 (Program Development System for PASCAL/D80). GRA

N84-31191# Army Avionics Research and Development Activity, Fort Monmouth, N. J.

TRI-SERVICE COMBINED ALTITUDE RADAR ALTIMETER (CARA): THE ARMY PERSPECTIVE

W. M. Gill *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 993-1003 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003586) Avail: NTIS HC A25/MF A01 CSCL 01/4

The CARA is being developed under an Air Force contract as a replacement for thirteen different types of radar altimeters now in the Air Force inventory. These thirteen types of radar altimeters range in age from seven to thirty eight years and in MTBF, from 39 to 570 hours. The Army requirements for CARA are for fixed wing aircraft; the OV-1D Mohawk and the new JVX Joint Services Advancd Vertical Lift Aircraft for which the Army is the executive agency. The OV-1D requirement provides a replacement for the AN/APN-171A(V). GRA

N84-31192# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

MATE STANDARDIZATION **c35**

R. E. Farmer *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1005-1012 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003587) Avail: NTIS HC A25/MF A01 CSCL 14/2

The MATE (Modular Automatic Test Equipment) program was developed to combat the proliferation of unique, expensive ATE within the Air Force. MATE incorporates a standard management approach and a standard architecture designed to implement a cradle-to-grave approach to the acquisition of ATE and to significantly reduce the life cycle cost of weapons systems support. These standards are detailed in the MATE Guides. The MATE Guides assist both the Air Force and Industry in implementing the MATE concept, and provide the necessary tools and guidance required for successful acquisition of ATE. The guides also provide the necessary specifications for industry to build MATE-qualifiable equipment. The MATE architecture provides standards for all key interfaces of an ATE system. The MATE approach to the acquisition and management of ATE has been jointly endorsed by the commanders of Air Force Systems Command and Air Force Logistics Command as the way of doing business in the future. Author (GRA)

N84-31193# Technology Development of California, Arlington, Tex.

SYSTEM PLANNING TOOL TO MEASURE COST AVOIDANCE RESULTING FROM INDEPENDENT ASSESSMENT TECHNIQUES APPLIED TO TEST PROGRAM SOFTWARE DEVELOPMENT **c61**

P. D. Kidd *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1017-1028 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003588) Avail: NTIS HC A25/MF A01 CSCL 12/1

Test Program (TP) software errors result in avoidable costs. This paper describes a mathematical concept, based on principles of probability theory, to determine system cost savings resulting from the application of Independent Assessment techniques to TP software development. Independent Assessment embodies both an engineering evaluation of hardware as well as the evaluation of software. The development of a cost savings model from this concept would result in a MATE tool which would allow system planners to better evaluate and minimize system life cycle costs. Such a model would allow planners to quantify the cost impact of TP software errors on Unit Under Test life cycle cost and to define and study specific means to minimize those costs. Author (GRA)

N84-31194# Boeing Aerospace Co., Seattle, Wash.

A CORPORATE APPROACH TO AN EMBEDDED SOFTWARE DEVELOPMENT AND SUPPORT STANDARD **c61**

D. D. Doe, D. E. Hilt, G. B. Wigle, J. P. Bateman, and L. L. Tripp *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1029-1041 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)

(AD-P003589) Avail: NTIS HC A25/MF A01 CSCL 09/2

During the last decade, embedded software has become an important part of the major products of The Boeing Company, which range from commercial jetliners to weapon systems for the Department of Defense. During ths time, standards and practices for embedded software development were not uniformly applied by each project/program, resulting in some projects/programs meeting goals more effectively than others. In late 1980, the upper-management of The Boeing Company launched a corporate-wide program to achieve a uniform and effective methodology for embedded software development and support. The program consists of four parts: (1) a comprehensive development and support standard, (2) a set of guidelines to help implement the standard, (3) the development and implementation of a plan to obtain a set of automated tools which support the standard and guidelines, and (4) an associated training program. This paper focuses on the Boeing Embedded Software Standard, and presents the results of some comparisons to the proposed MIL-STD-SDS and related Data Item Descriptions (DIDs). The Standards project was accomplished in three phases: (1) conceptual, (2) planning, and (3) development. The project was guided by a steering committee of multi-company experienced software representatives appointed by upper-management. The core project development team consisted of experienced software representatives from each of the participating companies. Author (GRA)

N84-31195# Rome Air Development Center, Griffiss AFB, N.Y.
MIL-STD DEFENSE SYSTEM SOFTWARE DEVELOPMENT c61
D. F. Bergstrom *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2, Nov. 1982 p 1043-1052 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003590) Avail: NTIS HC A25/MF A01 CSCL 09/2

The acquisition manager has a difficult task in determining the type(s) and amount of software and documentation to meet mission requirements. In April 1979 the Computer Software Management Subgroup of the Joint Logistics Commanders (JLC-JPCG-CRM9 sponsored a joint government-industry workshop in Monterey, California to address selected problem areas in the acquisition and development of defense system software. As a result of this workshop's recommendations, the JLC initiated the development of uniform Military Standards. GRA

N84-31196# Department of the Air Force, Washington, D.C.
COST/SCHEDULE MANAGEMENT FOR SOFTWARE DEVELOPMENT c61
H. Wendt and M. W. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1053-1069 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003591) Avail: NTIS HC A25/MF A01 CSCL 05/1

The importance of good cost/schedule analysis in the Program Management environment is taken for granted. Methods and procedures for WBS have been structured, taught, and generally are accepted as good management techniques. in a hardware environment, this WBS structure is applied to a proposed design or prototype. The basic hardware elements and interfaces are known; cost schedule estimates can be applied to the specific design elements. Software programs do not have a structure or design at contract award. A preliminary design compatible with current WBS criteria is not available until PDR. The pre-PDR software development is comparable to hardware R & D; what design does exist is based on a supposed prototype or model and not a suitable basis for cost/schedule forecasts. This paper discusses the need for a well planned software WBS and the numerous management and technical factors which must be planned for and developed to insure the WBS adequately represents the program and provides the needed controls.
Author (GRA)

N84-31197# Department of the Air Force, Washington, D.C.
SOFTWARE CONFIGURATION MANAGEMENT IN A PROJECT ENVIRONMENT c61
H. Wendt and M. W. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1071-1082 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003592) Avail: NTIS HC A25/MF A01 CSCL 05/1

The smooth transition of responsibility and flow of work and data within the software project is a prerequisite to project success and development productivity. Establishing a structure characterized by effective data management and control practices is the responsibility of the software manager and requires careful planning, an understanding of the specific data requirements each of the methodologies applied to the project, and definition of the data flow and reviews, audits, and milestones which support the development process. This paper describes how in a project environment data management is integrated under the software configuration discipline and how the program support library concept may be used to centralize data control responsibility within the organization. Author (GRA)

N84-31198# Rome Air Development Center, Griffiss AFB, N.Y.
APSE DATABASE USER SCENARIO c82
E. S. Kean *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1085-1096 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003593) Avail: NTIS HC A25/MF A01 CSCL 05/1

The Database facilities provided in the Ada (1) Integrated Environment are an integral part of the KAPSE/MAPSE design described in the STONEMAN document. Project management and configuration control facilities are essential elements in the design. They are provided through primitives in the database management system incorporated in the AIE KAPSE/Database. Large and small scale system development can be easily managed by manipulating the primitives to meet user requirements. The users may range from project managers, software designers, programmers, and quality assurance personnel to administrative support personnel. These users have very different functional requirements and make various demands on the database that will require a versatile and efficient database system. This paper describes the users interfaces and capabilities provided to AIE users during the development cycle of a software system.
Author (GRA)

N84-31199# Intermetrics, Inc., Dayton, Ohio.
ARCHITECTURAL AND CONTROL CONSIDERATIONS FOR A HIGH SPEED SIGNAL PROCESSOR IMPLEMENTED WITH AN Ada (TRADEMARK) EXECUTIVE c60
S. E. Adams and T. R. Butler *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1097-1112 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003594) Avail: NTIS HC A25/MF A01 CSCL 09/2

A common assumption in the design of digital signal processors is that the critical system resource is the raw multiplication rate of the Arithmetic Element (AE). Currently, the architecture of these processors is based upon a distributed control network with the number of AEs required to meet the computational load of the application. Simulation of this type of system has shown that the actual bottleneck is the depth and complexity of the control network. This paper examines a signal processor architecture and an Ada executive control structure which supports a dataflow language. These architecture and control structures have been tested in a component level simulation. Author (GRA)

N84-31200# Proprietary Software Systems, Inc., Beverly Hills, Calif.
PLANNING OF OPERATIONAL SOFTWARE IMPLEMENTATION TOOL c61
A. Spinak *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1115-1131 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003595) Avail: NTIS HC A25/MF A01 CSCL 05/1

This article describes the Planning of Operational Software

Implementation Tool. The plan is based upon the identification of the hierarchical relationship of the individual elements of the software design, the development of a sequence of functionally oriented demonstrable steps, the allocation of subroutines to the specific step where they are first required, and objective status reporting. The results are meaningful determination of milestones, improved managerial visibility, better project control, and ultimately a successful software development. Author (GRA)

N84-31201# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 3: EMBEDDED COMPUTER RESOURCES GOVERNING DOCUMENTS Final Report
C. A. Porubcansky, ed. Nov. 1982 337 p 9 Vol.
(AD-A142778; ASD(ENA)-TR-82-5031-Vol-3) Avail: NTIS HC A15/MF A01 CSCL 09/2

This is a collection of UNCLASSIFIED papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. Embedded computer resources governing documents are given. Author (GRA)

N84-31202# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 4: TUTORIAL: MIL-STD-1553 MULTIPLEX DATA BUS Final Report
C. A. Porubcansky, ed. Nov. 1982 112 p 9 Vol.
(AD-A142779; ASD(ENA)-TR-82-5031-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 09/2

This is a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. The Military Standard 1553 for the multiplex data bus is discussed. Author (GRA)

N84-31203# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 5: TUTORIAL: MIL-STD-1589 JOVIAL (J-73) HIGH ORDER LANGUAGE Final Report
C. A. Porubcansky, ed. Nov. 1982 194 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 9 Vol.
(AD-A142780; ASD(ENA)-TR-82-5031-Vol-5) Avail: NTIS HC A09/MF A01 CSCL 09/2

This is a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. A tutorial on Military Standard 1589 dealing with the JOVIAL (J-73) high order language is given. Author (GRA)

N84-31204# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 6: TUTORIAL: MIL-STD-1679 WEAPON SYSTEM SOFTWARE DEVELOPMENT Final Report
C. A. Porubcansky, ed. Nov. 1982 36 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 9 Vol.
(AD-A142781; ASD(ENA)-TR-82-5031-Vol-6) Avail: NTIS HC A03/MF A01 CSCL 09/2

This is a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. A tutorial on Military Standard 1679 dealing with weapon system hardware development is given. Author (GRA)

N84-31205# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 7: TUTORIAL: MIL-STD-1750, 16 BIT INSTRUCTION SET ARCHITECTURE Final Report
C. A. Porubcansky, ed. Nov. 1982 52 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 9 Vol.
(AD-A142782; ASD(ENA)-TR-82-5031-Vol-7) Avail: NTIS HC A04/MF A01 CSCL 09/2

This is a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. A tutorial on Military Standard 1750 dealing with 16 bit instruction set architecture is given. Author (GRA)

N84-31206# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 8: TUTORIAL: MIL-STD-1815 Ada HIGH ORDER LANGUAGE Final Report
C. A. Porubcansky, ed. Nov. 1982 170 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 9 Vol.
(AD-A142783; ASD(ENA)-TR-82-5031-Vol-8) Avail: NTIS HC A08/MF A01 CSCL 09/2

This is a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the Convention Center, Dayton, Ohio. The scope of the conference includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. A tutorial on Military Standard 1815 dealing with the high order language Ada is given. Author (GRA)

N84-31207# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
PROCEEDINGS OF THE 2ND AFSC (AIR FORCE SYSTEMS COMMAND) AVIONICS STANDARDIZATION CONFERENCE. VOLUME 9: TUTORIAL: NAVY CASE STUDY IMPLEMENTATION OF MILITARY STANDARDS Final Report
C. A. Porubcansky, ed. Nov. 1982 139 p Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 9 Vol.
(AD-A142784; ASD(ENA)-TR-82-5031-Vol-9) Avail: NTIS HC A07/MF A01 CSCL 09/2

This a collection of papers to be distributed to the attendees of the Second AFSC Avionics Standardization Conference at the convention Center, Dayton, Ohio. The scope of the Conference

includes the complete range of DOD approved embedded computer hardware/software and related interface standards as well as standard subsystems used within the Tri-Service community and NATO. The theme of the conference is Rational Standardization. Lessons learned as well as the pros and cons of standardization are highlighted. A tutorial on a Navy case study implementation of military standards is given. Author (GRA)

N84-31208# Nord-Micro Elektronic Feinmechanik G.m.b.H., Frankfort (West Germany).
DEVELOPMENT OF A DIGITAL AIR DATA COMPUTER USING MODERN MICROPROCESSORS, HYBRID CIRCUITS, AND PRESSURE SENSORS WITH FREQUENCY OUTPUT Final Report, Dec. 1982
Dieter Waldmann Bonn Bundesministerium fuer Forschung und Technologie May 1984 119 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-018; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

The development of an air data computer according to the standard ARINC 706 for the Airbus A 310 is reviewed. Features, mechanical construction, and software structure of the computer are described. The built-in test capability and the high reliability are discussed. Author (ESA)

N84-32249# Air Force Human Resources Lab., Williams AFB, Ariz.
FIBER OPTIC HELMET MOUNTED DISPLAY: A COST EFFECTIVE APPROACH TO FULL VISUAL FLIGHT SIMULATION
C. L. Hanson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 262-268 (For primary document see N84-32223 21-81)
(AD-P003482) Avail: NTIS HC A17/MF A01 CSCL 05/9

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-31209 Pennsylvania State Univ., University Park.
BLADE ENDWALL FLOWS IN AN AXIAL FLOW COMPRESSOR STAGE Ph.D. Thesis
Nekkant Sitaram 1983 229 p
Avail: Univ. Microfilms Order No. DA8409098

The existing literature on the complex endwall flows in axial flow turbomachines is reviewed critically. This review also indicates future directions for research on endwall flows in axial flow compressors. The secondary flow calculation presented in this thesis includes the effects of rotation and viscosity. The development of momentum integral equations for the endwall flow in a compressor includes blade boundary layer effects. The axial flow compressor facility of the Department of Aerospace Engineering at the Pennsylvania State University, which was used for experimental investigations of the endwall flows, is described. The overall performance and other preliminary experimental results are presented. Extensive radial flow surveys, carried out at design and at off design conditions, are presented and interpreted. Dissert. Abstr.

N84-31210# IIT Research Inst., Chicago, Ill. Materials Technology.
PROPERTY SCREENING AND EVALUATION OF CERAMIC TURBINE MATERIALS Final Technical Report, 1 Jul. 1979 - 30 Jul. 1983
D. C. Larsen and J. W. Adams Wright-Patterson AFB, Ohio AFWAL Apr. 1984 331 p
(Contract F33615-79-C-5100)
(AD-A142739; IITRI-M06054-48; AFWAL-TR-83-4141) Avail: NTIS HC A15/MF A01 CSCL 11/2

State-of-the-art technical ceramics, mainly silicon carbide and silicon nitride, that have potential as structural components in advanced gas turbine engines, were evaluated. Thermal and mechanical property data were generated on candidate materials, and the results were interpreted with respect to microstructure, purity, secondary phases, environmental effects, and processing methods. Measured properties were related to microstructure. Failure modes and the nature of the critical strength-controlling flaws were determined by optical and SEM fracture surface analysis. Structure-property relations were developed, and generated data were compared to literature data. To date, over sixty materials have been extensively characterized. Properties measured include: flexure strength, elastic modulus, stress-strain, fracture toughness, creep, oxidation, thermal expansion, thermal diffusivity, thermal shock, and stress rupture. Emphasis was placed on defining the limiting aspects of each material, such as the time-dependent strength relating to the existence of operable subcritical crack growth mechanisms. Property measurements were made up to 1500 C in air atmosphere. Author (GRA)

N84-31211# Institute for Defense Analyses, Alexandria, Va.
T700 ENGINE CASE STUDY REPORT. IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
P. F. Goree Aug. 1983 362 p
(Contract MDA903-79-C-0018)
(AD-A143104; AD-E500670; IDA-D-22; IDA/HQ-83-25969) Avail: NTIS HC A16/MF A01 CSCL 13/10

This document records the activities and presents the findings of the T700 Engine Case Study Report part of the IDA/OSD Reliability and Maintainability Study conducted during the period from July 1982 through August 1983. GRA

N84-31212# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
INCREASE OF EFFICIENCY IN COOLED HIGH TEMPERATURE TURBINES Final Report, Dec. 1982
Hans-Juergen Dietrichs, Hans-Wilhelm Happel, and Klaus Heinig Bonn Bundesministerium fuer Forschung und Technologie May 1984 128 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-019; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27

Experimental and theoretical studies were carried out in order to improve accuracy and cost effectiveness in the aerodynamic design of highly loaded high pressure turbines. Aerodynamic and heat transfer tests in cold air rigs and demonstration engines; inverse design of airfoils; a turbine noise calculation method; and basic studies for the development of an inviscid three-dimensional code are discussed. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-31213 Stanford Univ., Calif.
AN ON-LINE EQUIVALENT SYSTEM IDENTIFICATION SCHEME FOR ADAPTIVE CONTROL Ph.D. Thesis
Steven Mark Sliwa 1984 178 p
Avail: Univ. Microfilms Order No. DA8408356

A prime obstacle to the widespread use of adaptive control is

the degradation of performance and possible instability resulting from the presence of unmodeled dynamics. The approach taken is to explicitly include the unstructured model uncertainty in the output error identification algorithm. The internal model of the suboptimal compensator can periodically have its order increased by including these new modes. During this model building stage, provisions are made to apply heuristic rules to test the convergence prior to designing new compensators. Additionally, the recursive identification algorithm has been systematically extended to multiinput, multioutput systems. Enhancements were also made to reduce the computational burden of an algorithm for obtaining minimal state space realizations from the inexact multivariable transfer functions which result from the identification process. A number of potential adaptive control applications for this approach are illustrated using computer simulations. Results indicated that when speed of adaptation and plant stability are not critical, the proposed schemes converge to enhance system performance.
Dissert. Abstr.

N84-31214*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
INTERACTIVE AIRCRAFT FLIGHT CONTROL AND AEROELASTIC STABILIZATION Semiannual Report, 1 Nov. 1983 - 30 Apr. 1984
Terrence A. Weisshaar and David K. Schmidt May 1984 13 p (Grant NAG1-157)
(NASA-CR-173866; NAS 1.26:173866) Avail: NTIS HC A02/MF A01 CSCL 01C

The potential benefits and costs of optimizing both the structural stiffness and the active control of aircraft in a rational manner are investigated. The ultimate goal is to arrive at a unified treatment of structural and active control design for the stability augmentation of flexible aircraft. An exhaustive literature evaluation in the area of passive tailoring for aircraft performance is undertaken. A mathematical technique to be used for aeroservoelastic tailoring studies is described. Two analytical models, one elementary, the other sophisticated, are developed to illustrate the potential for aeroservoelastic tailoring. Both models have essential features of real world hardware, yet the physical understanding is not buried in a myriad of detail. These models are also described. M.A.C.

N84-31215*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FUEL CONSERVATIVE GUIDANCE CONCEPT FOR SHIPBOARD LANDING OF POWERED-LIFE AIRCRAFT
David N. Warner, Jr., Leonard A. McGhee (Analytical Mechanics Associates, Inc.), John D. McLean (Analytical Mechanics Associates, Inc.), and Gregory K. Schmidt Jun. 1984 79 p refs
(NASA-TM-85971; A-9783; NAS 1.15:85971) Avail: NTIS HC A05/MF A01 CSCL 01C

A simulation study was undertaken to investigate the application of energy conservative guidance (ECG) software, developed at NASA Ames Research Center, to improve the time and fuel efficiency of powered lift airplanes operating from aircraft carriers at sea. When a flightpath is indicated by a set of initial conditions for the aircraft and a set of positional waypoints with associated airspeeds, the ECG software synthesizes the necessary guidance commands to optimize fuel and time along the specified path. A major feature of the ECG system is the ability to synthesize a trajectory that will allow the aircraft to capture the specified path at any waypoint with the desired heading and airspeed from an arbitrary set of initial conditions. Five paths were identified and studied. These paths demonstrate the ECG system's ability to save flight time and fuel by more efficiently managing the aircraft's capabilities. Results of this simulation study show that when restrictions on the approach flightpath imposed for manual operation are removed completely, fuel consumption during the approach was reduced by as much as 49% (610 lb fuel) and the time required to fly the flightpath was reduced by as much as 41% (5 min). Savings due to ECG were produced by: (1) shortening the total flight time; (2) keeping the airspeed high as long as possible to minimize time spent flying in a regime in which more engine thrust is required for lift to aid the aerodynamic lift; (3) minimizing time spent flying at constant altitude at slow airspeeds; and (4) synthesizing a path from any location for a direct approach to landing without entering a holding pattern or other fixed approach path. E.R.

N84-31216*# California Univ., Los Angeles. Dept. of Mechanics and Structures.
AEROELASTIC EFFECTS IN MULTI-ROTOR VEHICLES WITH APPLICATION TO A HYBRID HEAVY LIFT SYSTEM. PART 1: FORMULATION OF EQUATIONS OF MOTION Final Report
C. Venkatesan and P. Friedman Washington NASA Aug. 1984 145 p refs
(Contract NAG2-116)
(NASA-CR-3822; NAS 1.26:3822) Avail: NTIS HC A07/MF A01 CSCL 01C

This report presents a set of governing coupled differential equations for a model of a hybrid aircraft. The model consists of multiple rotor systems connected by an elastic interconnecting structure, with options to add any combination of or all of the following components; i.e., thrusters, a buoyant hull, and an underslung weight. The dynamic equations are written for the individual blade with hub motions, for the rigid body motions of the whole model, and also for the flexible modes of the interconnecting structure. One of the purposes of this study is to serve as the basis of a numerical study aimed at determining the aeroelastic stability and structural response characteristics of a Hybrid Heavy Lift Airship (HHLA). It is also expected that the formulation may be applicable to analyzing stability and responses of dual rotor helicopters such as a Heavy Lift Helicopter (HLH). Futhermore, the model is capable of representing coupled rotor/body aeromechanical problems of single rotor helicopters.
Author

N84-31217*# Information and Control Systems, Inc., Hampton, Va.
INVESTIGATION AND APPRECIATION OF OPTIMAL OUTPUT FEEDBACK. VOLUME 1: A CONVERGENT ALGORITHM FOR THE STOCHASTIC INFINITE-TIME DISCRETE OPTIMAL OUTPUT FEEDBACK PROBLEM Final Report
Nesim Halyo and John R. Broussard Washington NASA Aug. 1984 56 p refs
(Contract NAS1-15759)
(NASA-CR-3828; NAS 1.26:3828; FR-683101-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 01C

The stochastic, infinite time, discrete output feedback problem for time invariant linear systems is examined. Two sets of sufficient conditions for the existence of a stable, globally optimal solution are presented. An expression for the total change in the cost function due to a change in the feedback gain is obtained. This expression is used to show that a sequence of gains can be obtained by an algorithm, so that the corresponding cost sequence is monotonically decreasing and the corresponding sequence of the cost gradient converges to zero. The algorithm is guaranteed to obtain a critical point of the cost function. The computational steps necessary to implement the algorithm on a computer are presented. The results are applied to a digital outer loop flight control problem. The numerical results for this 13th order problem indicate a rate of convergence considerably faster than two other algorithms used for comparison. M.A.C.

N84-31218*# Information and Control Systems, Inc., Hampton, Va.
INVESTIGATION, DEVELOPMENT AND APPLICATION OF OPTIMAL OUTPUT FEEDBACK THEORY. VOLUME 2: DEVELOPMENT OF AN OPTIMAL, LIMITED STATE FEEDBACK OUTER-LOOP DIGITAL FLIGHT CONTROL SYSTEM FOR 3-D TERMINAL AREA OPERATION Final Report
John R. Broussard and Nesim Halyo Washington NASA Aug. 1984 136 p refs
(Contract NAS1-15759)
(NASA-CR-3829; NAS 1.26:3829; FR-683111-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 01C

This report contains the development of a digital outer-loop three dimensional radio navigation (3-D RNAV) flight control system for a small commercial jet transport. The outer-loop control system is designed using optimal stochastic limited state feedback techniques. Options investigated using the optimal limited state feedback approach include integrated versus hierarchical control loop designs, 20 samples per second versus 5 samples per second outer-loop operation and alternative Type 1 integration command errors. Command generator tracking techniques used in the digital control design enable the jet transport to automatically track arbitrary curved flight paths generated by waypoints. The performance of the design is demonstrated using detailed nonlinear aircraft simulations in the terminal area, frequency domain multi-input sigma plots, frequency domain single-input Bode plots and closed-loop poles. The response of the system to a severe wind shear during a landing approach is also presented. Author

N84-31219*# Search Technology, Inc., Palo Alto, Calif.
RELIABILITY ANALYSIS OF AN ULTRA-RELIABLE FAULT TOLERANT CONTROL SYSTEM
R. E. Curry, W. E. VanderVelde, and P. R. Frey Jul. 1984 55 p refs
(NASA-CR-166594; NAS 1.26:166594; Rept-8404-1) Avail: NTIS HC A04/MF A01 CSCL 01C

This report analyzes the reliability of NASA's Ultra-reliable Fault Tolerant Control System (UFTCS) architecture as it is currently envisioned for helicopter control. The analysis is extended to air transport and spacecraft control using the same computational and voter modules applied within the UFTCS architecture. The system reliability is calculated for several points in the helicopter, air transport, and space flight missions when there are initially 4, 5, and 6 operating channels. Sensitivity analyses are used to explore the effects of sensor failure rates and different system configurations at the 10 hour point of the helicopter mission. These analyses show that the primary limitation to system reliability is the number of flux windings on each flux summer (4 are assumed for the baseline case). Tables of system reliability at the 10 hour point are provided to allow designers to choose a configuration to meet specified reliability goals. Author

N84-31129# General Dynamics Corp., Fort Worth, Tex. Fort Worth Div.
APPLICATION OF JOVIAL (J-73) TO DIGITAL FLIGHT CONTROLS
J. H. Robb, P. J. Boatman, and P. H. Lang *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 93-100 (For primary document see N84-31121 21-06)
(AD-P003525) Avail: NTIS HC A25/MF A01 CSCL 09/2

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-31220 Clemson Univ., S.C.
MULTI-VARIATE ACCEPTANCE PLANS FOR FLEXIBLE AIRPORT PAVEMENTS Ph.D. Thesis
Muhammed Ghassan Tarakji 1983 219 p
Avail: Univ. Microfilms Order No. DA8408879

In 1980, the Federal Aviation Administration (FAA), Eastern Region, incorporated a price adjustment schedule for the mat density in their Bituminous Surface Course Specifications (item P-401). The FAA did not include the rest of the acceptance variables (Marshall stability, flow and voids) in the price adjustment schedule because some of these variables are physically related. In this study, the relationships between the four acceptance variables are studied, and a theoretical procedure (general model) is formulated to measure the quality of asphalt mixtures in terms of a trivariate Percentage Within Limits (PWL) which is a function of the three Marshall properties. Because this procedure was found to have practical limitations, a univariate-bivariate mixed approach (mixed model) was formulated to approximate the trivariate PWL. For the mixed model, the asphalt mixture's PWL is calculated as the product of the stability univariate PWL and the flow-voids bivariate PWL. This approach gave satisfactory results when tested by computer simulation using various sample statistics.
Dissert. Abstr.

N84-31221# Chinese Aerodynamic Research and Development Center, Mianyang.
THE 6M X 6M LOW SPEED WIND TUNNEL
[1983] 8 p
Avail: NTIS HC A02/MF A01

The CARDC 8M X 6M low speed wind tunnel is presented. The wind tunnel is of the open circuit type with two tandem test sections: the first is 12 X 16 X 24M and the 2nd is 8 X 6 X 15M. The range of wind velocities of the 2nd section is 20-90 m/s. Three fans arranged in a triangle are driven by three motors with maximum total rated power 7800 kW. The tunnel was put into use in 1978. Force, moment, pressure and dynamic tests were conducted to evaluate aeronautical and wind engineering characteristics. E.A.K.

N84-31222# Aeronautical Research Labs., Melbourne (Australia).
SOME FACTORS AFFECTING THE SELECTION OF THE TYPE OF NEW TRANSONIC TUNNEL TO BEST MEET AUSTRALIAN NEEDS
N. Pollock Dec. 1983 20 p
(AD-A142957; ARL/AERO-TM-359) Avail: NTIS HC A02/MF A01 CSCL 14/2

A consideration of the new transonic wind tunnel options identified at the Dec. 1982 workshop held at ARL is presented. Factors discussed include: Reynolds number requirements, test section dimensions, operating pressure, individual run duration, total available testing time and operating costs. It is concluded that, despite the lower test Reynolds number capability, a continuous flow, conventional fan driven tunnel is more suited to Australian requirements than an intermittent blowdown tunnel. If a significant supersonic requirement existed this preference would probably be reversed. Author (GRA)

N84-31223# California Univ., Livermore. Lawrence Livermore Lab.
MODAL PARAMETER ESTIMATION VIA SHAKER VERSUS SPEAKER EXCITATION
H. Joseph Weaver and R. Bradley Burdick May 1984 14 p
(Contract W-7405-eng-48)
(DE84-012897; UCID-20085) Avail: NTIS HC A02/MF A01

When dynamically testing delicate laser components (e.g. an elliptical glass laser disc) it is often impossible to provide a direct contact excitation source such as an impact hammer or shaker. This is because of the delicate and/or brittle nature of the material from which the components are constructed. The alternate approach that is often used in a test of this type is to excite the component with an acoustic speaker. In this paper we describe a small series of tests in which we compare the modal parameters obtained by using a speaker as an excitation source with those obtained on the same object when the excitation was provided by a shaker. DOE

N84-31224# Centre Technique des Industries Mecaniques, Senlis (France).
TEST RIG FOR MEASURING HYDRAULIC EQUIPMENT NOISE Final Report [BANC D'ESSAI POUR LA MESURE DU BRUIT DES EQUIPEMENTS HYDRAULIQUES]
G. Bernard and J. C. Romani Apr. 1983 16 p In FRENCH
(CETIM-41-H-337) Avail: NTIS HC A02/MF A01

A hydraulic/acoustic noise measuring rig is described. It consists of a 2500 liter vat with level gages and regulated immersion heater for testing in hot water up to 70C, a variable speed

multistage centrifugal pump to allow for the adjustment of pressure from 0 up to 10 bars, and a maximum flow of 20 cum/hr; two flowmeters; a 2 in. diam. pipe extended by a hose 20 m in length for feeding the 1 in. diam. galvanized steel measurement pipeline; a standard noise generator; an anechoic termination for liquid. Acoustic equipment includes a hydrophone; an adjustable equalizing filter; a sound level meter. Author (ESA)

N84-32061# Joint Publications Research Service, Arlington, Va.
GASDYNAMIC STUDY OF MODEL WITH COMBUSTION IN SHOCK TUNNEL Abstract Only
V. K. Bayev, V. V. Shumskiy, and M. I. Yaroslavtsev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 51-52 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 58-66 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32225# Goodyear Aerospace Corp., Akron, Ohio. Simulator Systems Engineering Div.
CLOSING THE GAP BETWEEN AIRCRAFT AND SIMULATOR TRAINING WITH LIMITED FIELD-OF-VIEW (LFOV) VISUAL SYSTEMS
W. P. Leavy and M. Fortin (Rediffusion Simulation, Inc., Akron, Ohio) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 10-18 (For primary document see N84-32223 21-81)
(AD-P003448) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32226# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.
IMAGE GENERATOR ARCHITECTURES AND FEATURES
R. Latham *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 19-26 (For primary document see N84-32223 21-81)
(AD-P003449) Avail: NTIS HC A17/MF A01 CSCL 20/6

N84-32231# Boeing Military Airplane Development, Wichita, Kans.
CONCURRENCY OF DESIGN CRITERIA: A KEY TO TRAINER READINESS
J. Casperson and J. Jonas *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 60-63 (For primary document see N84-32223 21-81)
(AD-P003454) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32232# Honeywell, Inc., West Covina, Calif.
DETERMINING COST AND TRAINING EFFECTIVENESS TRADEOFFS FOR TRAINER DESIGN: TEST OF AN EXPERIMENTAL MODEL
R. A. Wienclaw and J. Orlansky (IDA, Alexandria, Va.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 64-73 (For primary document see N84-32223 21-81)
(AD-P003455) Avail: NTIS HC A17/MF A01 CSCL 05/1

N84-32233# Eagle Technology, Inc., Orlando, Fla.
COST-EFFECTIVE AND EFFICIENT MAINTENANCE TRAINING DEVICES: A USER ACCEPTED DESIGN PROCESS
W. F. Jorgensen and P. H. L. Brown *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 74-83 (For primary document see N84-32223 21-81)
(AD-P003456) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32234# Air Force Human Resources Lab., Williams AFB, Ariz.
TRAINING CAPABILITIES: THE FACILITY PART OF THE EQUATION
J. S. Kamchi and W. Dube *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 84-91 (For primary document see N84-32223 21-81)
(AD-P003457) Avail: NTIS HC A17/MF A01 CSCL 13/13

N84-32250# Singer Co., Lancing (England). Link-Miles Div.
DIGITAL CONTROL LOADING: A MICROPROCESSOR-BASED APPROACH
D. Parkinson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 269-273 (For primary document see N84-32223 21-81)
(AD-P003483) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32257# Boeing Military Airplane Development, Wichita, Kans.
INCREASED READINESS THROUGH MODULARITY
F. W. Snyder *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 329-334 (For primary document see N84-32223 21-81)
(AD-P003491) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32258# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
A FOUR-DIMENSIONAL THUNDERSTORM MODEL FOR FLIGHT SIMULATORS
J. T. Klehr *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 335-338 (For primary document see N84-32223 21-81)
(AD-P003492) Avail: NTIS HC A17/MF A01 CSCL 05/9

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-31225*# Martin Marietta Corp., Denver, Colo.
APPLICATION OF TOS/AMS TO TDRS E AND F Final Report
30 May 1984 207 p
(Contract NAS8-35617)
(NASA-CR-171124; NAS 1.26:171124; MCR-84-2140) Avail: NTIS HC A10/MF A01 CSCL 22A

The development of the Transfer Orbit Stage (TOS) and the study of an Apogee and Maneuvering Stage (AMS) to be used in conjunction with the TOS are presented. A definition of the TOS/AMS configuration is provided along with a detailed design analysis including layout drawings, component definition, performance, sts and spacecraft interface definition, schedules, cost estimates, and specifications documents. M.A.C.

N84-31226*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF EXTERNAL PRESSURE ENVIRONMENT ON THE INTERNAL NOISE LEVEL DUE TO A SOURCE INSIDE A CYLINDRICAL TANK
Sherman A. Clevenson and Louis A. Roussos Aug. 1984 24 p refs
(NASA-TM-85814; NAS 1.26:85814) Avail: NTIS HC A02/MF A01 CSCL 20A

A small cylindrical tank was used to study the effect on the noise environment within a tank of conditions of atmospheric (sea level) pressure or vacuum environments on the exterior. Experimentally determined absorption coefficients were used to calculate transmission loss, transmissibility coefficients and the sound pressure (noise) level differences in the interior. The noise level differences were also measured directly for the two exterior environments and compared to various analytical approximations with limited agreement. Trend study curves indicated that if the tank transmission loss is above 25 dB, the difference in interior noise level between the vacuum and ambient pressure conditions are less than 2 dB. Author

N84-31227# Pakistan Space and Upper Atmosphere Research Committee, Karachi.
SPACE RESEARCH IN PAKISTAN: A RELENTLESS PURSUIT
1982 30 p refs Presented at the 24th COSPAR meeting, Ottawa, 17 May - 2 Jun. 1982 Original contains color illustrations
Avail: NTIS HC A03/MF A01

The program development of space research in Pakistan is described. Topics include satellite, communications, astrophysics, geoscience, and meteorological program outlines as well as a description of remote sensing, geodesy, and training activities. M.A.C.

N84-31228# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
22 Aug. 1984 148 p refs Transl. into ENGLISH from various Russian articles
(JPRS-USP-84-004) Avail: NTIS HC A07

Recent Soviet aerospace activities involving space exploration and experiments in astronomy and astrophysics, aerospace medicine, aerospace engineering, and space technology utilization are described. Topics include observations and task outlines onboard the Salyut-7 space station, and the Soyuz T-11 and Progress-20 spacecraft, the physiological effects of weightlessness, and the methods and equipment used to monitor the physical condition of the cosmonauts onboard the Salyut-7 space station. For individual titles, see N84-31229 through N84-31239.

N84-31229# Joint Publications Research Service, Arlington, Va.
INNOVATIONS IN COSMONAUT MEDICAL MONITORING, PHYSICAL CONDITIONING Abstract Only c52
V. Pishchik *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 25 Transl. from Med. Gazeta (Moscow), 11 Apr. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

Medical monitoring information from the manned orbiting station Salyut-7, the status of medical/biological research aimed at heightening the safety and fitness of cosmonauts on prolonged space missions, and results of the first two months of work on board Salyut-7 are discussed. Particular attention is paid to the cosmonauts' metabolism studies and to the physical conditioning regime they are using. Changes are also made in conditioning and examination routines in which effects of negative pressure are produced on the lower half of the body with the aid of a special suit. Blood samples are taken from veins as well as fingers in monitoring of the cosmonauts' hormones, water/salt metabolism and blood. Ultrasonic echocardiography is used for evaluating the activity of the cardiovascular system. Psychological training allows the study of certain psychological problems which occur in small groups on prolonged missions. M.A.C.

N84-31230# Joint Publications Research Service, Arlington, Va.
MEDICAL RESEARCH IN FIRST 100 DAYS OF SALYUT-7 FLIGHT Abstract Only c52
V. Pishchik *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 42-43 Transl. into ENGLISH from Med. Gazeta (Moscow), 18 May 1984 p 4 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

The medical research portion of the first 100 days of the mission of the orbiting station Salyut-7 is examined. During the 100 days, 17 medical experiments are performed for the purpose of further studying effects of space flight conditions on the human organism, including studies of the cardiovascular system, the space form of motion, sickness and metabolic processes. Physical conditioning regimens using the exercycle and the running track are used for the purpose of preventing adverse effects of weightlessness. Functional tests in which negative pressure is applied to the lower half of the body is examined. These tests and cardiographic studies are done for the purpose of more fully evaluating reserve potentials of the cardiovascular system at various stages of a mission. The condition of the cosmonauts' hormonal systems, water/salt metabolism and blood systems are monitored. A glucose load functional test is performed to evaluate features of carbohydrate metabolism. A series of psychological and sanitary-and-hygienic studies are performed, as well as a number of otorhinolaryngologic examinations and studies of the fungus of the eye, which yield objective data on dynamics of the blood supply of the rhinopharynx, the tympanic membrane and the eye during various periods of adaptation to weightlessness. M.A.C.

N84-31231# Joint Publications Research Service, Arlington, Va.
COSMONAUT BEREZOVOY'S MEMOIRS ON 211-DAY SPACE-FLIGHT
V. Gorkoy and N. Konkov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 51-67 Transl. into ENGLISH from Aviats. i Kosmonavtika (Moscow), no. 7, Jul. 1983 p 40-43 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

The tasks and observations undertaken onboard the Salyut-7 space station are described through the recollections of a crew member. M.A.C.

N84-31232# Joint Publications Research Service, Arlington, Va.
EXCERPT FROM COSMONAUT ALEKSANDROV'S FLIGHT DIARY
In its USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 68-73 Transl. into ENGLISH from Izv. (Moscow), 4 Feb. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

A general account of activities onboard the Salyut-7 space station is presented. A personal description of visual observations and mission duties with emphasis on the living conditions of the cosmonauts is provided. M.A.C.

N84-31233# Joint Publications Research Service, Arlington, Va.
RESULTS FROM ASTRON SATELLITE AFTER ONE YEAR IN ORBIT
A. Severnyy *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 74-77 Transl. into ENGLISH from Pravda (Moscow), 23 Mar. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

Results from the far ultraviolet space telescope Astron are presented. Topics investigated include nonstationary phenomena in stars, anomalies in the chemical composition of stars, and the properties of ultraviolet radiation of galaxies and quasars. M.A.C.

N84-31234# Joint Publications Research Service, Arlington, Va.
HYPOKINESIA EXPERIMENT STUDIES EFFECTS OF WEIGHT-LESSNESS Abstract Only c52
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 80-81 Transl. into ENGLISH from Sots. Industr. (Moscow), 24 Mar. 1984 p 4 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

The methods and objectives of a hypokinesia experiment are described. The metabolic changes which can occur in the human organism during prolonged space missions, as a result of weightlessness are investigated. In the course of the experiment, mineral metabolism and the condition of the osteomuscular system are studied by neutron activation analysis and ultrasonic probing. The circumstances under which imbalances of metabolism occur in conditions of weightlessness and hypokinesia are examined. The potential effectiveness of preventive measures which have been proposed for minimizing losses of mineral substances in these conditions are investigated. M.A.C.

N84-31235# Joint Publications Research Service, Arlington, Va.
PRAVDA CITES ADVANTAGES OF PROJECT FOR ORBITING SOLAR REFLECTORS c15
Zh. Alferov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 84-86 Transl. into ENGLISH from Pravda (Moscow), 9 Apr. 1984 p 7 (For primary document see N84-31228 21-12)
Avail: NTIS HC A07

A series of useful economic applications for space reflectors is discussed. General features of the profitability configurations for future orbital lighting systems were worked out. B.G.

N84-31236# Joint Publications Research Service, Arlington, Va.
SPACE TRANSPORTATION SYSTEMS OF THE FUTURE c16
Sergey Dmitriyevich Grishin and Sergey Vasilyevich Chekalin *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 87-121 refs Transl. into ENGLISH from the book Kosmicheskiy Transport Budushchego (Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya), no. 11 Moscow, Znaniye, No. 11, Nov. 1983 p 15-59 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

Before predicting the development of space transport systems in the future, the achievements and shortcomings of existing means of transport-traditional launch vehicles and outer-space booster stages are examined. The concept of reusability and questions of profitability were discussed. Ramjet thermonuclear engines, photon rockets, electromagnetic engines, electromagnetic mass accelerators, laser applications, and the potentialities of advanced space transport systems with liquid fuel rocket motors were examined. The improvement of transport systems will continue together with the exploration. B.G.

N84-31237# Joint Publications Research Service, Arlington, Va.
ADVANTAGES OF METALLIC FUELS FOR ROCKET PROPULSION c28
Ya. I. Karker and G. Yu. Mazing *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 124-131 Transl. into ENGLISH from Khim. i Zhizn (Moscow), no. 12, Dec. 1983 p 80-84 (For primary document see N84-31228 21-12)
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Selecting the most efficient fuels and oxidizing agents is a paramount problem in space rocket technology. And the main energy index determining the efficiency of a rocket fuel is the exhaust velocity of the combustion products discharged from the nozzle. The greater the velocity the greater the engine thrust for a given fuel consumption, the less the fuel reserves required to achieve a given flight velocity and the greater the payload that a rocket can carry into orbit around the Earth or the planets of the solar system. Exhaust velocity is directly linked to the amount of heat that is given off during combustion per mass unit of combustion products. And the heat given off depends on the calorific power of the fuel and the amount of oxidizing agent needed for its complete combustion. The metal oxides are compared with the hydrocarbon fuels. B.G.

N84-31238# Joint Publications Research Service, Arlington, Va.
AZERBAIJAN INSTITUTE DEVELOPS SUBSATELLITE MEASUREMENT SYSTEMS c43
T. Ismailov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 133-136 Transl. into ENGLISH from Pravda (Moscow), 27 Mar. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

The subsatellite automatic data measuring system is used in aerial and satellite control-measurement areas. The system was designed for reception, preprocessing of data (in a search or operational mode) and the change from occasional to systematic measurements of various parameters of natural objects. Author

N84-31239# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 141-142 Transl. into ENGLISH from Tass (Moscow), 3 Apr. - 30 May 1984 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

The orbital parameters (apogee, perigee, period, and inclination) are given for Soviet spacecraft launched between 3 April 1984, and 17 May 1984. B.G.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-31240 Stanford Univ., Calif.
OPTIMAL LOW-THRUST TRANSFERS TO GEOSYNCHRONOUS ORBIT Ph.D. Thesis
David Campbell Redding 1984 140 p
Avail: Univ. Microfilms Order No. DA8408345

The general problem of circle-to-circle transfer is examined for chemical rocket spacecraft, following Lawden's primer vector theory. Impulsive and near-impulsive transfers are analyzed to predict initial conditions for low-thrust transfers. A computer solution of the low-thrust problem is described. Results are presented for the low Earth orbit to geosynchronous orbit case, showing behavior of the optimal thrust direction, and developing transfer efficiency figures for a range of acceleration limits. Both fixed-thrust and fixed-acceleration propulsion systems are considered. Multiple-burn transfers are considered. Algebraic approximations for total time and loss are presented which are accurate for relatively fuel-efficient (low-loss) transfers. It is shown that gravity losses for a transfer can be reduced to an arbitrarily low level if enough burns are done, irrespective of acceleration level. Dissert. Abstr.

N84-31241# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ANGLES-ONLY, GROUND-BASED, INITIAL ORBIT DETERMINATION
L. G. Taff, P. M. S. Randall, and S. A. Stansfield 14 May 1984 47 p
(Contract F19628-80-C-0002)
(AD-A142994; TR-618; ESD-TR-84-011) Avail: NTIS HC A03/MF A01 CSCL 22/3

Over the past few years, passive, ground-based, angles-only initial orbit determination has had a thorough analytical, numerical, experimental, and creative re-examination. This report presents the numerical culmination of this effort and contains specific recommendations for which of several techniques one should use on the different subsets of high altitude artificial satellites and minor planets. Author (GRA)

N84-32109# Joint Publications Research Service, Arlington, Va.
NON-INTEGRABILITY OF PLANAR OSCILLATION EQUATION FOR SATELLITE IN ELLIPTICAL ORBIT Abstract Only
A. A. Burov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 89-90 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat., Mekhan. (Moscow), no. 1, Jan. - Feb. 1984 p 71-73 Original language document previously announced in IAA as A84-27889 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-31242 Stanford Univ., Calif.
HELIUM THRUSTOR PROPULSION SYSTEM FOR PRECISE ATTITUDE CONTROL AND DRAG COMPENSATION OF THE GRAVITY PROBE-B SATELLITE Ph.D. Thesis
Jeng-Heng Chen 1984 256 p
Avail: Univ. Microfilms Order No. DA8408264

This thesis is concerned with: (1) the design and test of proportional helium thrustors, and (2) the optimal configuration of the thrustors for attitude control and drag compensation of the gravity probe-B spacecraft. The propellant for the helium thrustors is the constant boiloff waste gas from cryogenic liquid helium. Differential thrust is obtained by movement of a spool located between two opposing nozzles thus differentially restricting the helium flow. The design procedure and test results of a high bandwidth, low power, good linear electromagnetic actuator for the spool movement are presented. Test of the thrustor in a vacuum chamber to evaluate its performance has also been done. Two mathematical models are used to describe the helium flow through the thrustor under difficult flow conditions. The experimental data measured in the vacuum chamber and the computational results from the mathematical models are compared. Dissert. Abstr.

N84-31243# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN ADAPTIVE ATTITUDE CONTROLLER FOR TERRESTRIAL ARTIFICIAL SATELLITES [UM CONTROLADOR ADAPTATIVO DE ATITUDE PARA SATELITES ARTIFICIAIS TERRESTRES]
Joao Moro, Atair Rios Neto, and Hernani Luiz Brinati (Sao Paulo Univ., Brazil) Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/ 50th Congr. Brasileiro de Automatica - 10 CLA/50 CBA, Campina Grande, Brazil 3-6 Sep. 1984
(INPE-3186-PRE/551) Avail: NTIS HC A02/MF A01

The analysis and preliminary synthesis of a three-axis active attitude control system for low orbit artificial satellites is considered. Starting from the application of the separation principle, under approximated conditions, a solution of the control problem for nonlinear dynamic systems is presented. The solution uses a stochastic control procedure in which its duality with the estimation problem is explored to calculate the gains of the feedback control law. State estimates are provided by the extended Kalman filter associated with adaptive techniques of dynamic model compensation and state-noise evaluation. The result is an adaptive controller, with capacity to operate in situations in which the system dynamic is not completely known. Tests of the proposed procedure are conducted for preliminary evaluation using a digital simulation of a natural resources remote sensing satellite. The quality of the results obtained pre-qualify the procedure for applications in systems of attitude control in real time. Author

N84-31244# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A ROCKET-BORNE LANGMUIR PROBE FOR IN-SITU MEASUREMENT OF IONOSPHERIC PLASMA
P. Muralikrishna and M. A. Abdu Jul. 1984 14 p refs To be presented in the SBPC, 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3206-PRE/564) Avail: NTIS HC A02/MF A01

A Langmuir probe payload, to be flown on-board SONDA 3 and SONDA 4 rockets, is being developed at INPE. The major scientific objectives of the experiment are the measurements of electron density and electron temperature, the study of the spectral distribution of electron density irregularities in the ionosphere, and the study of the plasma irregularities in the equatorial electrojet. The payload basically consists of a Langmuir Probe sensor and an electronic system. A sweep voltage varying between -1V and +4V is applied to the sensor, and the current collected by it is converted into a varying voltage signal, and is amplified and telemetered to the ground. The sensor signal is processed through three different channels. The total signal at low gain is transmitted through one of the telemetry channels, the second channel carries the signal processed at an automatic gain control unit. The signal, after passing through a band pass filter, is transmitted through the third channel. The sensor current and its slope with respect to the sensor voltage, as measured through the first two channels, give information about the electron density and electron temperature, the third channel contains information about the electron density irregularities. Author

N84-31245# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTIMIZATION OF THE CAPTURE PROCESS FOR A RIGID SATELLITE STABILIZED BY GRAVITY GRADIENT
Joao Ricardo deFreitas Oliveira and Donizeti Leonel Ferreira Jul. 1984 8 p refs Presented at the 1st Latin-American Conf. on Automatic Control and the 5th Brazilian Conf. on Automatic Control, Campina Grande, Brazil, 3-6 Sep. 1984
(INPE-3184-PRE/549) Avail: NTIS HC A02/MF A01

The optimization of the capture of a rigid satellite in librational motion is discussed. The low Earth circular orbit satellite is stabilized by gravity gradient through the extension of a mast (boom) with a tip mass. The satellite has a symmetry axis along the mast axis and is modelled by a system of two, second order, nonlinear, nonautonomous, coupled differential equations. This system is numerically integrated in a digital computer. A method based on two nonsequential extensions of the mast (dead beat) is proposed, in order to get the minimization of the residual librational motion after the mast has been totally deployed. The timing for the two stages of deployment is used as a control variable. The method can be used in real time. Some of the results obtained on digital computer simulation are presented. M.A.C.

N84-31246# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PITCH CONTROL OF A SATELLITE USING STABILIZING FLAPS [CONTROLE DO MOVIMENTO DE ARFAGEM DE UM SATELITE FOR ALETAS ESTABILIZADORAS]
Luiz Danila Damasceno Ferreira, Atair Rios Neto, and Nellore Srinivasan Venkataraman Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/50th Congr. Brasileiro de Automatica - 1 CLA/50 CBA - Campina Grande, 3-6 Sep. 1984
(INPE-3185-PRE/550) Avail: NTIS HC A02/MF A01

The modelling and analysis of the attitude control system for low orbit artificial satellites, using stabilizing flaps are presented. The function of the system is to maintain the satellite aligned with the local vertical. The aerodynamic forces on the satellite are modelled assuming free molecular flow using the Kinetic Theory of Gases. The control system development is considered through the application of stochastic control concepts. The satellite motion is described by the equations of motion based on Newtonian formulation. Starting from separation principle, and sequential procedure is developed in which the state estimation and control problems are handled simultaneously. State estimate is provided by Kalman filter by using the information about the position of the satellite and of the flaps. The controller acts on the satellite in real time, and the stabilizing flaps being the only control elements. Author

N84-31247# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
REVERSE ENGINEERING OF THE MULTIPLE LAUNCH ROCKET SYSTEM. HUMAN FACTORS, MANPOWER, PERSONNEL, AND TRAINING IN THE WEAPONS SYSTEM ACQUISITION PROCESS Research Note Report, Jul. 1983 - Jun. 1984
J. M. Arabian, C. R. Hartel, J. D. Kaplan, A. Marcus, and D. M. Promisel Jun. 1984 110 p
(DA Proj. 2Q2-63731-A-792)
(AD-A142849; ARI-RN-84-102) Avail: NTIS HC A06/MF A01

CSCL 19/7

In a briefing format, this report on the Multiple Launch Rocket System summarizes an examination of human factors, manpower, personnel and training (HMPT) issues during the systems acquisition process. The report is one of four reverse engineering studies prepared at the request of Gen. M. R. Thurman, Army Vice Chief of Staff. The four systems were studied as a representative sample of Army weapons systems. They serve as the basis for drawing conclusions about aspects of the weapons system acquisition process which most affect HMPT considerations. A synthesis of the four system studies appears in the final report of the Reverse Engineering Task Force U.S. Army Research Institute.

Author (GRA)

N84-31248# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

ADVANCED TECHNOLOGY FOR SAM SYSTEMS ANALYSIS SYNTHESIS AND SIMULATION

Loughton, England May 1984 119 p refs Lecture Series held in Porz-Wahn, West Germany, 25-26 Jun. 1984, Rome, 28-29 Jun. 1984, and London, 2-3 Jul. 1984

(AGARD-LS-135; ISBN-92-835-0353-8) Avail: NTIS HC A06/MF A01

The introduction of new technologies and techniques in the analysis, synthesis and simulation of SAM systems seen from the point of view of guidance and control are considered. Topics covered include: methodology for conception of advanced systems; new concepts for missile control, and in particular for terminal control; present capability and future technology for seeker systems simulation; warhead technologies; homing head imperfections altering missile guidance; and terrain bounce countermeasures against monopulse seeker system. For individual titles, see N84-31249 through N84-31257.

N84-31249# Thomson-CSF, Bagneux (France). Div. Systemes Electroniques.

ADVANCED TECHNOLOGY FOR SAM SYSTEMS ANALYSIS, SYNTHESIS AND SIMULATION

Marc Paulet *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 6 p In FRENCH and ENGLISH (For primary document see N84-31248 21-15)

Copyright. Avail: NTIS HC A06/MF A01

An overview is presented of techniques and technologies being used in the development of defensive weapons with emphasis on the analysis, synthesis, and simulation of surface to air weapon missiles. Improvements in guidance, control, and warheads are also discussed. A.R.H.

N84-31250# MATRA Service Aerodynamique, Velizy-Villacoublay (France). Dept. d'Analyse de Systemes Militaires.

METHOD FOR DESIGNING FUTURE WEAPONS SYSTEMS: EXAMPLE OF THE VERY SHORT DISTANCE GROUND-AIR SYSTEMS [METHODOLOGIE DE LA CONCEPTION DES SYSTEMES D'ARMES FUTURS. EXEMPLE DES SYSTEMES SOL-AIR TRES COURTE PORTEE]

J. F. Gondet *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 23 p In FRENCH (For primary document see N84-31248 21-15)

Copyright. Avail: NTIS HC A06/MF A01

The assemblage and series of studies that it is desirable to perform before launching the development of a new weapon system are described. Focus is on the important steps in this approach made up of multicriteria-based comparative studies of the system being considered in order to address operational problems posed. To illustrate these methods, a parametric study is presented of very short distance surface to air missiles from which certain conclusions were considered in defining the Mistral system.

Transl. by A.R.H.

N84-31251# Royal Military Coll. of Science, Shrivenham (England).

SOME ASPECTS OF GUIDANCE LOOP DESIGN FOR SAM SYSTEMS

D. J. East *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 14 p refs (For primary document see N84-31248 21-15)

Copyright. Avail: NTIS HC A06/MF A01

The basic structure of guidance loops for SAM systems is considered and two important practical problems associated with their design and implementation if optimum performance is to be achieved are discussed. The nature of the switching transients that occur when loop parameters are changed is examined and the fundamental requirements for transient free operation are presented. A computer aided design procedure for synthesizing a minimum bandwidth system which satisfies a stringent sensitivity specification despite large uncertainty in the plant being controlled is illustrated by means of a significant autopilot design example.

Author

N84-31252# CETA, Angouleme (France).

TERMINAL CONTROL FOR COMMAND TO LINE OF SIGHT GUIDED MISSILE

Jean-Loupy Durieux *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 14 p refs (For primary document see N84-31248 21-15)

Copyright. Avail: NTIS HC A06/MF A01

The implementation of terminal control guidance laws on line of sight, radio commanded missiles is discussed. Specific problems examined include: rangefinding accuracy, effects of tracker filtering, and switching from stationary to terminal controller. Performance is compared with active homing guidance for the case of medium-range, surface to air missiles. The parameters compared are: missile path curvature, agility, and effects of sensor noise. Both conventional and optimal control laws are considered. E.A.K.

N84-31253# Societe Nationale Industrielle Aerospatiale, Paris (France). Div. des Engins Tactiques.

A NEW CONCEPT FOR GUIDING MISSILES WITH AN APPLICATION TO THE GROUND-AIR SYSTEM [UN NOUVEAU CONCEPT DE PILOTAGE DES MISSILES APPLICATION AUX SOL-AIR]

G. Selince *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 12 p refs In FRENCH (For primary document see N84-31248 21-15)

Copyright. Avail: NTIS HC A06/MF A01

The PIF,PAF system associates to conventional control surfaces the action of gas jets creating lateral forces applied near the missile center of gravity. The advantages of the two devices are then cumulated, leading to very short response time and large lateral accelerations, even at low speed or high altitude, as the PIF rapidity makes up for the PAF dynamic error. The result is a notable decrease of miss distance against highly maneuvering targets. General principles of such a guidance system and examples of possible applications to surface to air missiles with antimissile capability are presented. Transl. by A.R.H.

N84-31254# Army Missile Command, Redstone Arsenal, Ala. Systems Simulation and Development Directorate.

SEEKER SYSTEMS SIMULATION, PRESENT CAPABILITY AND FUTURE TECHNOLOGY

K. V. Grider *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 10 p (For primary document see N84-31248 21-15)

Avail: NTIS HC A06/MF A01

The missile command's use of seeker in the loop real time simulation in the development of surface to air missile systems is discussed. Material is presented to show that seeker in the loop simulation makes a very positive contribution in the context of the current constraints on weapon system development, such as limited resources, the requirement for convincing system demonstrations, and the requirement for evaluation in a realistic environment including electromagnetic countermeasures and counter-countermeasures. The present facilities and capabilities for such simulation in the radiofrequency, nonimaging infrared and electro-optical bands are described and discussed. Examples of simulation results and their contribution to cost effective system development are presented. Developing technology in this simulation area and plans for future increased simulator capability are addressed. The

development of multimode or multispectrum, imaging infrared, and millimeter wave simulators are discussed. E.A.K.

N84-31255# Selenia S.p.A., Rome (Italy). Defence Systems Div.
MISSILE SYSTEM FOR LOW ALTITUDE AIR DEFENCE
Robert Brown and Gianfranco Santi *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 8 p ref (For primary document see N84-31248 21-15)
Copyright. Avail: NTIS HC A06/MF A01

Simulation techniques adopted in the design and development phases of the low altitude surface to air missile system SPADA are described. Two distinct areas are examined: one as a tool to validate system concepts, the other in conjunction with field tests to complete operational evaluation. The defense of high value targets (typically airports), within friendly territory, from low level, high speed air raids is examined. The location of such defended targets which is known to the enemy, and attacks are preplanned to take advantage of terrain contours and of electronic countermeasures (screening and deception) to avoid or to delay detection by the defence systems and therefore narrow in to the target, reaching useful weapon release distances. A missile system which is specifically designed for airport defence and considers identification and integrity of friendly A/C was developed. The system named SPADA enchances system survivability to attacks and adapts to the change of objective which are to be defended. E.A.K.

N84-31256# Thomson-CSF, Malakoff (France). Div. Avionique.
HOMING HEAD IMPERFECTIONS ALTERING MISSILE GUIDANCE
M. Desmerger *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 6 p (For primary document see N84-31248 21-15)
Copyright. Avail: NTIS HC A06/MF A01

The electromagnetic homing head imperfections which alter the missile guidance were analyzed. Problems connected with detection of the targets such as detection time, parasitic signals rejection, and phenomena introducing errors on target parameters such as thermal noise, parasitic signals, nature of the target, radome aberrations are discussed. E.A.K.

N84-31257# Messerschmitt-Boelkow-Blohm G.m.b.H., Schrobenhausen (West Germany). Research and Future Programmes for Warheads and Fuzes Dept.
WARHEADS FOR SAM SYSTEMS
M. Held *In* AGARD Advan. Technol. for SAM Systems Anal. Syn. and Simulation May 1984 18 p (For primary document see N84-31248 21-15)
Copyright. Avail: NTIS HC A06/MF A01

The effectiveness of surface to air missiles (SAM) warheads are to be described with the use of lethality models. Missile hits are divided in direct hits and near pass. In the near pass the fragmenting warheads transfer the HE-energy to the target much more effectively than blast warheads. With high hit densities special synergistic or cumulative effects is accomplished. Synergetic or cumulative effects are discussed. Special high fragment beam densities are obtained by aimable warheads. E.A.K.

N84-31144# General Dynamics Corp., San Diego, Calif.
APPLICATION OF 1553B TO MRASM (MEDIUM RANGE AIR TO SURFACE MISSILE): A SYSTEMS LOOK
J. E. Leib *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 295-304 (For primary document see N84-31121 21-06)
(AD-P003540) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31145# General Dynamics Corp., San Diego, Calif.
MIL-STD-1553B IN MRASM (MEDIUM RANGE AIR TO SURFACE MISSILE): THE DESIGNER'S CHALLENGE
V. L. Elmore *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 305-313 (For primary document see N84-31121 21-06)
(AD-P003541) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31235# Joint Publications Research Service, Arlington, Va.
PRAVDA CITES ADVANTAGES OF PROJECT FOR ORBITING SOLAR REFLECTORS
Zh. Alferov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 84-86 Transl. into ENGLISH from Pravda (Moscow), 9 Apr. 1984 p 7 (For primary document see N84-31228 21-12)
Avail: NTIS HC A07

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-31258*# Martin Marietta Corp., Denver, Colo.
SPACECRAFT SERVICING DEMONSTRATION PLAN Final Report
F. H. Bergonz, M. A. Bulboaca, and W. L. DeRocher, Jr. Jul. 1984 312 p
(Contract NAS8-35496)
(NASA-CR-171132; NAS 1.26:171132; MCR-84-1866) Avail: NTIS HC A14/MF A01 CSCL 22B

A preliminary spacecraft servicing demonstration plan is prepared which leads to a fully verified operational on-orbit servicing system based on the module exchange, refueling, and resupply technologies. The resulting system can be applied at the space station, in low Earth orbit with an orbital maneuvering vehicle (OMV), or be carried with an OMV to geosynchronous orbit by an orbital transfer vehicle. The three phase plan includes ground demonstrations, cargo bay demonstrations, and free flight verifications. The plan emphasizes the exchange of multimission modular spacecraft (MMS) modules which involves space repairable satellites. Three servicer mechanism configurations are the engineering test unit, a protoflight quality unit, and two fully operational units that have been qualified and documented for use in free flight verification activity. The plan balances costs and risks by overlapping study phases, utilizing existing equipment for ground demonstrations, maximizing use of existing MMS equipment, and rental of a spacecraft bus. E.R.

N84-31259*# Chrysler Corp., Huntsville, Ala. Data Management Services.
AEROTHERMODYNAMIC DATA BASE, PHASE C Data File Contents Report, Jan. - Jun. 1984
10 Jul. 1984 424 p
(Contract NAS9-16283)
(NASA-CR-173862; NAS 1.26:173862; DMS-DFR-2098) Avail: NTIS HC A18/MF A01 CSCL 22B

Space shuttle aerothermodynamic data, collected from a continuing series of wind tunnel tests, are permanently stored with the Data Management Services (DMS) system. Information pertaining to current baseline configuration definition is also stored. Documentation of DMS processed data is listed, arranged sequentially and by space shuttle configuration. An up-to-date record of all applicable aerothermodynamic data collected, processed, or summarized during the space shuttle program is provided. Tables are designed to provide survey information to the various space shuttle managerial and technical levels. M.G.

N84-31260*# Chrysler Corp., Michoud, La. Data Management Services.
RESULTS OF THE AFRSI DETAILED-ENVIRONMENT TEST OF THE 0.035-SCALE SSV PRESSURE-LOADS MODEL 84-0 IN THE AMES 11X11 FT. TWT AND THE LEWIS 8X6 FT. AND 10X10 FT. SWT (OA-310A, B, C), VOLUME 2
B. A. Marshall and J. Marroquin Jul. 1984 63 p refs Prepared in cooperation with Rockwell International, Downey, Calif. Document includes microfiche supplement 2 Vol.

(Contract NAS9-16283)
(NASA-CR-167686; NAS 1.26:167686; DMS-DR-1459-Vol-2) Avail: NTIS HC E16/MF A01 CSCL 22B

In order to support analysis of the STS-6 advanced flexible reusable surface insulation (AFRSI) anomaly, data were obtained for aerodynamic and aeroacoustic environments in affected areas of the orbiter. Data are presented in tabular form. M.G.

N84-31261*# Chrysler Corp., Michoud, La. Data Management Services.
RESULTS OF THE AFRSI DETAILED-ENVIRONMENT TEST OF THE 0.035-SCALE SSV PRESSURE-LOADS MODEL 84-0 IN THE AMES 11X11 FT. TWT AND THE LEWIS 8X6 FT. AND 10X10 FT. SWT (OA-310A, B, C), VOLUME 1
B. A. Marshall and J. Marroquin Jul. 1984 386 p refs Prepared in cooperation with Rockwell International, Downey, Calif. 2 Vol. (NASA-CR-167685; NAS 1.26:167685; DMS-DR-2459-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 22B

Detailed orbiter aerodynamic and aeroacoustic pressure data were obtained in a three-part experimental investigation (OA-310A, B and C). The tests were conducted in three NASA facilities: OA-310A in the Ames 11x11-foot Transonic Wind Tunnel; OA-310B in the Lewis 8x6-foot Supersonic Wind Tunnel; and OA-310C in the Lewis 10x10-foot Supersonic Wind Tunnel. Test data were obtained to support analysis of the Space Transportation System (STS)-6 advanced flexible reusable surface insulation (AFRSI) anomaly using the 0.035-scale space shuttle vehicle pressure-loads Model 84-0. Data were obtained in the areas of the orbiter where AFRSI is to be applied to OV-099 and OV-103. Emphasis was placed on acquiring detailed aeroacoustic data and time-averaged pressure distributions on five affected areas: (1) canopy; (2) side of fuselage; (3) upper surface of wing; (4) OMS pods; and (5) vertical tail. Data were obtained at nominal ascent and entry atmospheric flight trajectory conditions between M=0.6 through M-3.5. Sample plotted data are given. M.G.

N84-31236# Joint Publications Research Service, Arlington, Va.
SPACE TRANSPORTATION SYSTEMS OF THE FUTURE
Sergey Dmitriyevich Grishin and Sergey Vasilyevich Chekalin *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 87-121 refs Transl. into ENGLISH from the book Kosmicheskiy Transport Budushchego (Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya), no. 11 Moscow, Znaniye, No. 11, Nov. 1983 p 15-59 (For primary document see N84-31228 21-12) Copyright. Avail: NTIS HC A07

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-31262 Stanford Univ., Calif.
ATTITUDE DYNAMICS OF THE GALILEO SPACECRAFT
Ph.D. Thesis
Michael G. Ward 1984 330 p
Avail: Univ. Microfilms Order No. DA8406375

A model of the attitude dynamics of the Galileo spacecraft has been developed for purposes of simulating various spacecraft attitudes controlled maneuvers. Because of complex mission requirements, the Galileo spacecraft structure includes components whose flexibility is important to the spacecraft attitude behavior and which must be considered in the development of a stable attitude control system. The model formulation is based on an efficient procedure for deriving equations of motion, and the resulting equations of motion form the basis for a flexible body dynamics simulation which can provide controls analysts with a means of testing various control algorithms. Dissert. Abstr.

N84-31263*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION SYSTEMS ANALYSIS STUDY. VOLUME 1: EXECUTIVE SUMMARY, PART 1 AND 2 Final Report
25 Mar. 1977 119 p refs
(Contract NAS8-31993)
(NASA-CR-161590; NAS 1.26:161590;
NSS-SS-RP014-Vol-1-Pt-1/2) Avail: NTIS HC A06/MF A01 CSCL 22B

The elements of space station programs required to support an operational base theme, a space laboratory theme, and advanced missions relatable to public needs/national interests are defined. Missions satisfying the foregoing requirements are identified, program scenarios/options are established. System options are evaluated for a selected number of program options. Subsystem analysis and programmatic comparisons are performed for selected primary concepts. A.R.H.

N84-31264*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION SYSTEMS ANALYSIS STUDY. VOLUME 2: PROGRAM REVIEW REPORT Final Report
20 Apr. 1977 105 p refs
(Contract NAS8-31993)
(NASA-CR-161231; NAS 1.26:161231; NSS-SS-RP016-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 22B

Major growth options for tended and manned space stations in LEO and GEO are examined including increased orbiter augmentation and habitation requirements. Approaches for providing power supplies, construction aids needed to assemble support platforms, transportation system constraints, and the hardware required for various missions categories are defined. Subsystem requirements are analyzed for structure; flight control; power generation and storage; avionic; life support systems; personnel provisions; and environmental control. Tradeoffs are considered. A.R.H.

N84-31265*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION SYSTEMS ANALYSIS STUDY. VOLUME 2: PROGRAM OPTIONS, BOOK 1, PARTS 1 AND 2 Final Report
25 Mar. 1977 344 p refs
(Contract NAS8-31993)
(NASA-CR-161927; NAS 1.26:161927;
NSS-SS-RP014-Vol-2-Bk-1-Pt-1/2) Avail: NTIS HC A15/MF A01 CSCL 22B

Program options are defined and requirements are determined for integrating crew, mass, volume, and electrical power for a space construction base which incorporates the space shuttle external tanks. Orbits, stabilization, flight control hardware, as well as modules and aids for orbital assembly and servicing are considered. The effectiveness of various program options for life science and radio astronomy missions, for the solar terrestrial observatory, and for public service platforms is assessed. Technology development items are identified and costs are estimated. A.R.H.

N84-31266*# General Electric Co., Philadelphia, Pa. Space Div.
ON ORBIT SURFACING OF THERMAL CONTROL SURFACES Monthly Progress Report
G. W. Racette May 1984 12 p
(Contract NAS8-35342)
(NASA-CR-171121; NAS 1.26:171121; MPR-7) Avail: NTIS HC A02/MF A01 CSCL 22B

Substrates to be contaminated and contamination source were prepared. Additional information on paint spray method apparatus was obtained. Silver teflon second surface mirror samples and S 13 GLO paint samples were mounted, photographed under the microscope and measured to establish baseline data. Atomic oxygen cleaning and spray painting are being considered. Electrostatic powder and plasma spray coating systems appear to have serious drawbacks. A.R.H.

N84-31267*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
DIGITAL CONTROL SYSTEM FOR SPACE STRUCTURAL DAMPERS Annual Report
J. K. Haviland Jul. 1984 59 p refs
(Grant NAG1-349)
(NASA-CR-173867; NAS 1.26:173867; UVA/528224/MAE85/102) Avail: NTIS HC A04/MF A01 CSCL 22B

Digital control systems for space structural dampers, also referred to as inertia or proof-mass dampers are investigated. A damper concept is improved by adding a small taper to the proof-mass, and using a proximeter to determine position. Another damper using a three inch stroke rather than the standard one inch stroke is described. Provisions are made for a relative velocity feedback. In one approach, the digital controller is modified to accept the signal from a linear velocity transducer. In the other, the velocity feedback is included in the digital program. An overall system concept for the use of the dampers is presented. M.A.C.

N84-31268# Mission Research Corp., San Diego, Calif.
ELECTRON CHARGING AND SGEMP (SYSTEM GENERATED ELECTROMAGNETIC PULSE) STUDIES ON SATELLITE DIELECTRICS Final Report, 15 Apr. 1978 - 31 Oct. 1979
J. D. Riddell, V. A. J. VanLint, B. C. Passenheim, and D. A. Fromme 1 Jan. 1983 66 p
(Contract DNA001-79-C-0083)
(AD-A143012; AD-E301421; MRC/SD-R-112; DNA-6212F) Avail: NTIS HC A04/MF A01 CSCL 22/2

An experiment was conducted to measure the electrical response of satellite thermal control dielectrics when exposed to mono-energetic electron beams from 5 to 30 keV. Responses included SGEMP pulses when exposed to short (less than 100 ns) pulses of low energy X-rays (less than 2 keV), and spontaneous discharges. Significant SGEMP enhancement was noted as a result of precharging, and is explained by a theory which includes low-energy secondary electrons which escape via lateral edge fields. Potential profiles were taken across the sample surface during charging and after discharges. Transient measurements included charge flowing from the substrate, charge blown off the test object, and between different portions of the substrate. Two anomalous events are reported which showed blow-off lasting up to a microsecond after photon exposure, accompanied by a late time substrate current. GRA

N84-31269# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Space Div.
TESTING OF COATINGS IN SPACE, LONG DURATION EXPOSURE FACILITY (LDEF) Final Report, Oct. 1981
Hubert Bauer, Peter Goedtke, Klaus Groh, Otto-Karl Husmann, Ludwig Preuss, Wolfram Schaefer, Claus Wita, and Josef Zwiegel Bonn Bundesministerium fuer Forschung und Technologie May 1984 326 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-017; ISSN-0170-1339) Avail: NTIS HC A15/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 49

Thermal coatings of the flexible second surface mirrors type, and conductive coatings on solar cell covers were qualified for operation in 24 hr orbit. The coatings are exposed to the low Earth orbit space environment for a longer period by means of the LDEF. Accompanying laboratory experiments supplement the flight experiment. The flight experiment was developed, especially the establishment of test and functional specifications, materials and weight lists, temperature prediction for thermal tests, the defined stowage, and the completion of three accompanying ground experiments (near UV solar simulation, contamination experiment, and charging experiment). Author (ESA)

N84-31270*# National Academy of Sciences - National Research Council, Washington, D. C. Space Applications Board.
PRACTICAL APPLICATIONS OF A SPACE STATION
1984 104 p refs
(Contract NSR-09-012-106)
(NASA-CR-173672; NAS 1.26:173672; PB84-194794) Avail: NTIS HC A06/MF A01 CSCL 22B

The potential uses of a special station for civil and commercial applications is examined. Five panels of experts representing user-oriented communities, and a sixth panel which dealth with system design considerations, based their studies on the assumption that the station would be a large platform, capable of housing a wide array of diverse instruments, and could be either manned or unmanned. The Earth's Resources Panel dealt with applications of remote sensing for resource assessment. The Earth's Environment Panel dealt with the Earth's atmosphere and its impact on society. The Ocean Operations Panel looked at both science and applications. The Satellite Communications Panel assessed the potential role of a space station in the evolution of commercial telecommunication services up to the year 2000. The Materials Science and Engineering panel focused on the utility of a space station environment for materials processing.
Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-31271*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BRESEX: ON BOARD SUPERVISION, BASIC ARCHITECTURE AND PRELIMINARY ASPECTS FOR PAYLOAD AND SPACE SHUTTLE INTERFACE
Eduardo Whitaker Bergamini, Alderico Rodrigues dePaula, Jr., and Ricardo Correa de Oliveira Martins Jul. 1984 23 p Presented at the NASA/INPE Conf. on Brazilian Remote Sensing Experiment - BRESEX, Sao Jose dos Campos, Brazil, 13-14 Mar. 1984 Sponsored by NASA
(NASA-CR-173673; NAS 1.26:173673; INPE-3200-PRE/562) Avail: NTIS HC A02/MF A01 CSCL 22B

Data relative to the on board supervision subsystem are presented which were considered in a conference between INPE and NASA personnel, with the purpose of initiating a joint effort leading to the implementation of the Brazilian remote sensing experiment - (BRESEX). The BRESEX should consist, basically, of a multispectral camera for Earth observation, to be tested in a future space shuttle flight. A.R.H.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-31272*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE POTENTIAL IMPACT OF NEW POWER SYSTEM TECHNOLOGY ON THE DESIGN OF A MANNED SPACE STATION
J. Stuart Fordyce and Harvey J. Schwartz 1984 12 p refs Presented at the 14th Intern. Symp. on Space Technol. and Sci., Tokyo, 28 May - 1 Jun. 1984; sponsored by Inst. of Space and Astronautical Science
(NASA-TM-83770; E-2261; NAS 1.15:83770) Avail: NTIS HC A02/MF A01 CSCL 21H

Larger, more complex spacecraft of the future such as a manned Space Station will require electric power systems of 100 kW and more, orders of magnitude greater than the present state of the art. Power systems at this level will have a significant impact on the spacecraft design. Historically, long-lived spacecraft have relied on silicon solar cell arrays, a nickel-cadmium storage battery and operation at 28 V dc. These technologies lead to large array areas and heavy batteries for a Space Station application. This, in turn, presents orbit altitude maintenance, attitude control, energy management and launch weight and volume constraints. Size (area) and weight of such a power system can be reduced if new higher efficiency conversion and lighter weight storage technologies are used. Several promising technology options including concentrator solar photovoltaic arrays, solar thermal dynamic and ultimately nuclear dynamic systems to reduce area are discussed. Also, higher energy storage systems such as nickel-hydrogen and the regenerative fuel cell (RFC) and higher voltage power distribution which add system flexibility, simplicity and reduce weight are examined. Emphasis is placed on the attributes and development status of emerging technologies that are sufficiently developed so that they could be available for flight use in the early to mid 1990's. Author

N84-31273*# Lockheed Missiles and Space Co., Huntsville, Ala. Systems Analysis and Simulation Section.
PRELIMINARY ENGINEERING REPORT FOR DESIGN OF A SUBSCALE EJECTOR/DIFFUSER SYSTEM FOR HIGH EXPANSION RATIO SPACE ENGINE TESTING Final Report
C. J. Wojciechowski, S. C. Kurzius, and M. F. Doktor Apr. 1984 150 p refs
(Contract NAS8-35051)
(NASA-CR-171137; NAS 1.26:171137; LMSC-HREC-TR-D951414) Avail: NTIS HC A07/MF A01 CSCL 21H

The design of a subscale jet engine driven ejector/diffuser system is examined. Analytical results and preliminary design drawings and plans are included. Previously developed performance prediction techniques are verified. A safety analysis is performed to determine the mechanism for detonation suppression. M.A.C.

N84-31274*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ION BEAMLET STEERING FOR TWO-GRID ELECTROSTATIC THRUSTERS M.S. Thesis
John M. Homa Jul. 1984 83 p refs
(Grant NGR-06-002-112)
(NASA-CR-174671; NAS 1.26:174671) Avail: NTIS HC A05/MF A01 CSCL 21C

An experimental study of ion beamlet steering in which the direction of beamlets emitted from a two grid aperture system is controlled by relative translation of the grids, is described. The results can be used to design electrostatic accelerating devices for which the direction and focus of emerging beamlets are important. Deflection and divergence angle data are presented for two grid systems as a function of the relative lateral displacement of the holes in these grids. At large displacements, accelerator grid impingements become excessive and this determines the maximum allowable displacement and as a result the useful range of beamlet deflection. Beamlet deflection is shown to vary linearly with grid offset angle over this range. The divergence of the beamlets is found to be unaffected by deflection over the useful range of beamlet deflection. The grids of a typical dished grid ion thruster are examined to determine the effects of thermally induced grid distortion and prescribed offsets of grid hole centerlines on the characteristics of the emerging beamlets. The results are used to determine the region on the grid surface where ion beamlet deflections exceed the useful range. Over this region high accelerator grid impingement currents and rapid grid erosion are predicted. M.A.C.

N84-31275*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
THE ANNULAR FLOW ELECTROTHERMAL RAMJET M.S. Thesis
Ben D. Shaw Jul. 1984 109 p refs
(Grant NGR-06-002-112)
(NASA-CR-174704; NAS 1.26:174704) Avail: NTIS HC A06/MF A01 CSCL 21C

The annular flow, electrothermal, plug ramjet is examined as a possible means of achieving rapid projectile acceleration to velocities for such applications as direct launch of spacebound payloads. The performance of this ramjet operating with hydrogen propellant is examined for cases where this working fluid is treated: (1) as a perfect gas, and (2) as a gas that is allowed to dissociate and ionize and then recombine with finite reaction rates in the nozzle. Performance results for these cases are compared to the performance of a conventional ramjet operating with perfect gas hydrogen propellant. The performance of the conventional ramjet is superior to that of the annular flow, electrothermal ramjet. However, it is argued that the mechanical complexities associated with conventional ramjet operation are difficult to attain, and for this reason the annular flow, electrothermal ramjet is more desirable as a launch system. Models are presented which describe both electrothermal plug ramjet and conventional ramjet operation, and it is shown that for a given flight velocity there is a rate of heat addition per unit propellant mass for which ramjet operation is optimized. Author

N84-31276# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
COMPUTATIONAL METHODS: 1984 JPM SPECIALIST SESSION
Karen L. Strange, ed. Feb. 1984 99 p refs Meeting held in New Orleans, 9 Feb. 1984
(Contract N00024-83-C-5301)
(AD-A142923; CPIA-Publ-401) Avail: NTIS HC A05/MF A01 CSCL 21/2

Combustor modeling techniques and ramjet design, the use of computational fluid dynamics to analyze turbulent flow, exponential-fitted methods applied to homogenous gas-phase chemical kinetics, numerical methods for integrating chemical rate equations, and models for calculating reaction rates in turbulent flow are considered herein. For individual titles, see N84-31277 through N84-31281.

N84-31277# Science Applications, Inc., Chatsworth, Calif. Combustion Science and Advanced Technology Dept.
COMPUTATIONAL HIERARCHY FOR THE ANALYSIS OF COMBUSTION PHENOMENA IN RAMJET ENVIRONMENTS
P. T. Harsha and R. B. Edelman *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 1-24 refs (For primary document see N84-31276 21-20)
Avail: NTIS HC A05/MF A01 CSCL 21/2

The status of combustor modeling and the applications of available modeling techniques in the analysis of ramjet design features are illustrated. The concept of a hierarchy of models is advanced as a strategy to combine appropriate models of specific aspects of the ramjet combustor flowfield, and to use models of unit processes to deal with particular problems that occur in a ramjet development program. The impact of various parameters such as pressure, temperature, fuel-air ratio, Mach number, wall friction, and heat transfer on modeling is discussed. R.S.F.

N84-31278# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
STATIONARY STATE COMPUTATIONAL FLUID DYNAMICS FOR AERO-PROPULSION DEVICES c34

G. J. Sturgess *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 25-52 refs (For primary document see N84-31276 21-20)
Avail: NTIS HC A05/MF A01 CSCL 20/4

Views of turbulent flows are presented, and alternative methods of representing such flows are described. These approaches encompass stationary and non-stationary treatments. The needs of the aerospace industry are described and it is shown how these influence the choice of turbulence treatment for engineering use. A flow experiment that has a non-stationary nature is selected from the literature. Calculations made by both turbulence approaches were compared to this experiment. It is concluded that the stationary state approach gives a good representation of the experimental flow, and that time-mean predictions of flow are a reasonable engineering goal. The non-stationary approach shows the potential of making contributions to the understanding of turbulence. Author

N84-31279*# Seattle Univ., Wash.
EXPONENTIAL-FITTED METHODS FOR INTEGRATING STIFF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS: APPLICATIONS TO HOMOGENEOUS GAS-PHASE CHEMICAL KINETICS c64
David T. Pratt *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 53-68 refs (For primary document see N84-31276 21-20)
(Grant NAG3-227)
Avail: NTIS HC A05/MF A01 CSCL 12A

Conventional algorithms for the numerical integration of ordinary differential equations (ODEs) are based on the use of polynomial functions as interpolants. However, the exact solutions of stiff ODEs behave like decaying exponential functions, which are poorly approximated by polynomials. An obvious choice of interpolant are the exponential functions themselves, or their low-order diagonal Pade (rational function) approximants. A number of explicit, A-stable, integration algorithms were derived from the use of a three-parameter exponential function as interpolant, and their relationship to low-order, polynomial-based and rational-function-based implicit and explicit methods were shown by examining their low-order diagonal Pade approximants. A robust implicit formula was derived by exponential fitting the trapezoidal rule. Application of these algorithms to integration of the ODEs governing homogenous, gas-phase chemical kinetics was demonstrated in a developmental code CREK1D, which compares favorably with the Gear-Hindmarsh code LSODE in spite of the use of a primitive stepsize control strategy. Author

N84-31280*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPARISON OF THE EFFICIENCY OF NUMERICAL METHODS FOR INTEGRATING CHEMICAL KINETIC RATE EQUATIONS
K. Radhakrishnan *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 69-82 refs (For primary document see N84-31276 21-20)
(Grant NAG3-147)
Avail: NTIS HC A05/MF A01 CSCL 21H

The efficiency of several algorithms used for numerical integration of stiff ordinary differential equations was compared. The methods examined included two general purpose codes EPISODE and LSODE and three codes (CHEMEQ, CREK1D and GCKP84) developed specifically to integrate chemical kinetic rate equations. The codes were applied to two test problems drawn from combustion kinetics. The comparisons show that LSODE is the fastest code available for the integration of combustion kinetic rate equations. It is shown that an iterative solution of the algebraic energy conservation equation to compute the temperature can be more efficient then evaluating the temperature by integrating its time-derivative. Author

N84-31281# Cooper Union, New York. School of Engineering.
MODELS FOR CALCULATING REACTION RATES IN TURBULENT, REACTING FLOWS
W. Chinitz *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 83-98 refs (For primary document see N84-31276 21-20)
Avail: NTIS HC A05/MF A01 CSCL 21/2

Approaches developed to treat the effects of turbulent fluctuations on the determination of turbulent mean reaction rates were considered. The following approaches are described and their perceived limitations discussed: (1) assumed probability density function (PDF) models, (2) PDF transport equation models, (3) expansion and asymptotic methods, and (4) heuristic models. Recommendations are given for those investigators in the computational fluid dynamics field working on reacting flow problems. R.S.F.

N84-31282# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
BATTERIES AND ACCUMULATORS FOR FUTURE AEROSPATIALE PROJECTS [PILES ET ACCUMULATEURS DANS LES FUTURS PROJETS DE L'AEROSPATIALE]
F. Legrand 1984 31 p In FRENCH Presented at ASTED Table Ronde: Generation et Stockage d'Energie, Paris, 8 Nov. 1983
(SNIAS-841-422-111) Avail: NTIS HC A03/MF A01

Electric power supplies for the Hermes space shuttle and space station supply vehicles are discussed. Propellant batteries of H2/O2 type are recommended, since they can also supply drinking water, to be used for temperature control and to supply oxygen to the cabin. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-31283*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATION OF VAPORIZATION RATES ASSUMING VARIOUS RATE DETERMINING STEPS: APPLICATION TO THE RESISTOJET
Charles E. May Aug. 1984 58 p refs
(NASA-TM-83757; E-2244; NAS 1.15:83757) Avail: NTIS HC A04/MF A01 CSCL 07D

The various steps that could control the vaporization rate of a material are discussed. These steps include the actual vaporization, flow rate of matrix gas, chemical reaction, gas diffusion, and solid state diffusion. The applicable equations have been collected from diverse appropriate sources, and their use is explained. Rate equations are derived for conditions where more than one step is rate controlling. Calculations are made for two model materials: rhenium which vaporizes congruently, and tantalum carbide which vaporizes incongruently. The case of vaporization under thermal gradient conditions is also treated. The existence of a thermal gradient in the resistojet means that the vaporization rate of a material may be only one thousandth of that predicted under isothermal conditions. Calculations show that rhenium might have a 100,000 hr lifetime at temperature in a 2500 C resistojet. Tantalum carbide would have a life of only 660 sec under similar conditions. Author

N84-31284*# San Jose State Univ., Calif. Dept. of Chemistry.
CHARACTERIZATION AND DEGRADATION STUDIES ON SYNTHETIC POLYMERS FOR AEROSPACE APPLICATION Final Report, 1 Oct. 1981 - 10 Dec. 1982
Ming-ta S. Hsu Dec. 1982 53 p refs
(Contract NCC2-28)
(NASA-CR-166597; NAS 1.26:166597) Avail: NTIS HC A04/MF A01 CSCL 11B

The anti-misting additive for jet fuels known as FM-9 (proprietary polymer) was characterized by elemental analysis, solubility studies and molecular weight determination. Physical properties of surface tension, viscosity, specific gravity and other physical parameters were determined. These results are compared with properties of

polyisobutylene and fuels modified with the same; the misting characteristics of polyisobutylene and FM-9 in Jet A fuel are included. Characterization and degradation of phthalocyanine and its derivatives were accomplished by use of a mass spectrometer and a pyroprobe solid pyrolyzer. Metal phthalocyanine tetracarboxylic acids and phthalocyanine-tetraamine cured epoxies were studied. Epoxy/graphite composite panels were exposed to a NASA-Ames radiant panel fire simulator in the flaming and non-flaming modes; toxic gases of HCN and HZS were measured along with oxygen, Co2, Co, and organic gases. Author

N84-31285*# Manville Service Corp., Denver, Colo.
OPACIFICATION OF HIGH TEMPERATURE FIBROUS INSULATION
W. C. Miller and J. O. Collins Jul. 1984 30 p
(Contract NAS2-11294)
(NASA-CR-166578; NAS 1.26:166578) Avail: NTIS HC A03/MF A01 CSCL 11D

A study was conducted to determine the merits of adding particulate materials to silica fiber felts to increase their resistance to the passage of thermal radiation. Laboratory samples containing 5, 10, and 15 percent of chromium oxide, silicon carbide, and titanium dioxide were prepared and evaluated in accordance with ASTM C-518 thermal conductivity test method at 425 C (800 F) mean temperature. The titania particles averaging 3-4 micrometers in diameter were found to be the most effective. This was followed by a short plant run, in order to confirm the initial results on the laboratory samples. These samples were tested according to ASTM C-201 High Temperature Calorimeter from 93 C to 760 C (200 F to 1400 F) mean temperature. The ten percent by weight of titania resulted in an optimum effectiveness, and reduced the conductivity over 20% at 760 C (1400 F). Author

24 COMPOSITE MATERIALS

Includes laminates.

N84-31286 California Univ., Los Angeles.
SINGLE AND MULTIPLE FIBER MODELS FOR FRACTURE OF FIBROUS COMPOSITES Ph.D. Thesis
Dianne Shows Wiley 1983 144 p
Avail: Univ. Microfilms Order No. DA8410088

The problem of force transfer from broken, debonded fibers to unbroken fibers of a fiber reinforced composite lamina is examined within the framework of linear two dimensional elastostatics. Two models of the fiber are used to study the effects of fiber flexibility, debond length, location and number of broken fibers on the axial force distributions in the fibers. First, the fiber is modelled as a finite length rod with zero thickness (the line inclusion model) embedded in an infinite elastic matrix. The fiber may be broken at any location and debonded from the matrix in the neighborhood of the break. The presence of an array of such fibers causes shearing stresses along the fiber matrix interface. Equilibrium between the fiber axial force and shear stress leads to a system of coupled Cauchy integral equations whose kernels contain square root singularities. The equations are solved numerically, and axial force distributions in the fibers are calculated. Force concentrations interaction zone is defined as the region over which the force concentration factors exceed unity.
Dissert. Abstr.

N84-31287*# Lockheed-California Co., Burbank.
FLIGHT SERVICE EVALUATION OF KEVLAR-49 EPOXY COMPOSITE PANELS IN WIDE-BODIED COMMERCIAL TRANSPORT AIRCRAFT Final Annual Flight Service Report
R. H. Stone Jun. 1984 50 p refs
(Contract NAS1-11621)
(NASA-CR-172344; NAS 1.26:172344; FAFSR-10) Avail: NTIS HC A03/MF A01 CSCL 11D

Kevlar-49 fairing panels, installed as flight service components on three L-1011s, were inspected after 10 years of service. There are six Kevlar-49 panels on each aircraft: a left-hand and right-hand set of a wing-body sandwich fairing; a solid laminate under-wing fillet panel; and a 422 K (300 F) service aft engine fairing. The three L-1011s include one each in service with Eastern, Air Canada, and TWA. The fairings have accumulated a total of 79,568 hours, with one ship set having nearly 28,000 hours service. The inspections were conducted at the airlines' major maintenance bases with the participation of Lockheed Engineering. The Kevlar-49 components were found to be performing satisfactorily in service with no major problems, or any condition requiring corrective action. The only defects noted were minor impact damage, a few minor disbonds and a minor degree of fastener hole fraying and elongation. These are for the most part comparable to damage noted on fiberglass fairings. The service history obtained in this program indicates that Kevlar-49 epoxy composite materials have satisfactory service characteristics for use in aircraft secondary structure. Author

N84-31288*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF FINITE ELEMENT SUBSTRUCTURING TO COMPOSITE MICROMECHANICS M.S. Thesis - Akron Univ., May 1984
John J. Caruso Aug. 1984 70 p refs
(Grant NsG-350)
(NASA-TM-83729; E-2203; NAS 1.15:83729) Avail: NTIS HC A04/MF A01 CSCL 11D

Finite element substructuring is used to predict unidirectional fiber composite hygral (moisture), thermal, and mechanical properties. COSMIC NASTRAN and MSC/NASTRAN are used to perform the finite element analysis. The results obtained from the finite element model are compared with those obtained from the simplified composite micromechanics equations. A unidirectional composite structure made of boron/HM-epoxy, S-glass/IMHS-epoxy and AS/IMHS-epoxy are studied. The finite element analysis is performed using three dimensional isoparametric brick elements and two distinct models. The first model consists of a single cell (one fiber surrounded by matrix) to form a square. The second model uses the single cell and substructuring to form a nine cell square array. To compare computer time and results with the nine cell superelement model, another nine cell model is constructed using conventional mesh generation techniques. An independent computer program consisting of the simplified micromechanics equation is developed to predict the hygral, thermal, and mechanical properties for this comparison. The results indicate that advanced techniques can be used advantageously for fiber composite micromechanics. Author

N84-31289*# Stanford Univ., Calif. Joint Inst. for Surface and Microstructure Research.
PHYSICAL AGING AND ITS INFLUENCE ON THE RELIABILITY OF NETWORK EPOXIES AND EPOXY-MATRIX COMPOSITES Final Technical Report, 1 Nov. 1982 - 31 Jul. 1983
K. Heinemann 31 Jul. 1983 82 p refs
(Contract NCC2-103)
(NASA-CR-173870; NAS 1.26:173870) Avail: NTIS HC A05/MF A01 CSCL 11D

The matrix-dominated physical and mechanical properties of a carbon fiber reinforced epoxy composite and a neat epoxy resin were found to be affected by sub-Tg annealing in nitrogen and dark atmosphere. Postcured specimens of Thornel 300 carbon-fiber/Fiberite 934 epoxy as well as Fiberite 934 epoxy resin were quenched from above Tg and given annealing at 140 C, 110 C, or 80 C, for time up to one-hundred thousand minutes. No weight loss was observed during annealing at these temperatures. Significant variations were found in density, modulus, hardness, damping, moisture absorption ability, thermal expansivity. Moisture-epoxy interactious were also studied. The kinetics of aging as well as the molecular aggregation during this densification process were monitored by differential scanning calorimetry, dynamic mechanical analysis, density gradient column, microhardness tester, Instron, and solid-state nuclear magnetic resonance spectroscopy. Author

N84-31290*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering, Science and Mechanics.
RESIDUAL STRENGTH OF FIVE BORON/ALUMINUM LAMINATES WITH CRACK-LIKE NOTCHES AFTER FATIGUE LOADING Final Report
R. A. Simonds Washington NASA Jul. 1984 38 p refs
(Contract NAS1-17100)
(NASA-CR-3815; NAS 1.26:3815) Avail: NTIS HC A03/MF A01 CSCL 11D

Boron/aluminum specimens were made with crack-like slits in the center and with various proportions of 0 and + or - 45 deg plies. They were fatigue loaded and then fractured to determine their residual strengths. The fatigue loads were generally in the range of 60 to 80 percent of the static tensile strength of the specimen as determined from a previous study, and the stress ratio was .05. For virtually all of the specimens the fatigue loading was continued for 100,000 cycles. The specimens were radiographed after the fatigue loading to determine the nature of the fatigue damage. A few specimens were sectioned and examined in a scanning electron microscope after being radiographed in order to verify the interpretation of the radiographs and also to get a better insight into the nature of the fatigue damage. The results indicate that the fatiguing does not significantly affect the strength of the specimens tested. The results of the radiography and of the scanning electron microscopy indicate that the 45 deg plies suffer extensive damage in the form of split and broken fibers and matrix cracking in the vicinity of the ends of the split. By contrast, the only significant damage to the 0 deg plies was a single 0 deg matric crack growing from the ends of the slit and between the 0 deg fibers. M.G.

N84-31291*# Washington State Univ., Pullman. Dept. of Physics.
FRACTO-EMISSION FROM GRAPHITE/EPOXY COMPOSITES Annual Report
J. Thomas Dickinson Jul. 1983 100 p refs
(Contract NCA2-OR840-202)
(NASA-CR-173845; NAS 1.26:173845) Avail: NTIS HC A05/MF A01 CSCL 11D

Fracto-emission (FE) is the emission of particles and photons during and following crack propagation. Electrons (EE), positive ions (PIE), and excited and ground state neutrals (NE) were observed. Results of a number of experiments involving principally graphite/epoxy composites and Kevlar single fibers are presented. The physical processes responsible for EE and PIE are discussed as well as FE from fiber- and particulate-reinforced composites. A.R.H.

N84-31292# Plymouth Polytechnic (England). School of Engineering Science.
THE MECHANICAL PROPERTIES OF CARBON FIBRE WITH GLASS FIBRE HYBRID REINFORCED PLASTICS Ph.D. Thesis. Final Report
John Summerscales and David Short May 1983 239 p refs
Previously announced as N84-24710 Sponsored by the Science and Engineering Research Council
Avail: NTIS HC A11/MF A01

Fiber composite hybrid materials are generally plastics reinforced with two different fiber species. The combination of these three materials (carbon fibers, glass fibers and polyester resin) allows a balance between the properties of the two monofiber composites. The hybrid effect, a synergistic strengthening of reinforced plastics with two fibers when compared with the strength predicted from a weighted average from the component composites, is examined mathematically. A new equation is presented which predicts the extent of the hybrid effect. Experiments with a variety of carbon/glass hybrids were undertaken to examine the validity of the theory and the effect of the degree of intermixing of the fibers. The classification and quantification of the hybrid microstructures was examined with a view to cross correlation of the intimacy of mixing and the strength. Mechanical tests are monitored with acoustic emission counting and acoustic emission amplitude distribution equipment. Fracture surfaces were examined in the scanning electron microscope. Numerical analysis by finite element methods was attempted. M.A.C.

N84-31293# Aeronautical Research Labs., Melbourne (Australia).
EVALUATION OF A VIBRATION TECHNIQUE FOR DETECTION OF BARELY-VISIBLE IMPACT-DAMAGE IN COMPOSITES
R. Jones and A. Goldman Dec. 1983 22 p
(AD-A142807; AD-E401119; ARL/Struc-TM-370) Avail: NTIS HC A02/MF A01 CSCL 11/4

A vibration analysis technique has been used for nondestructive evaluation of the integrity of fiber composite components which contain barely-visual impact-damage. A description of the method and the associated problems is presented together with the results of laboratory tests. Author (GRA)

N84-31294# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Sciences.
A NEW APPROACH TO THE EVALUATION OF THE EFFECTS OF STRESS STATE AND INTERFACIAL PROPERTIES ON THE BEHAVIOR OF ADVANCED METAL MATRIX COMPOSITES Technical Report, Jul. 1981 - May 1984
J. E. Hack, R. A. Page, and G. R. Leverant 31 May 1984 107 p
(Contract DAAG29-81-K-0049)
(AD-A143083; ARO-17207.3-MS) Avail: NTIS HC A06/MF A01 CSCL 11/4

The effects of fiber fraction, fiber orientation and matrix alloy additions on tensile and fatigue behavior were studied in commercially pure magnesium and ZE41A (Mg-4.25Zn-0.5Zr-1.25RE) that were both reinforces with FP alumina fibers. In general, axial properties were found to be dependent of fiber fraction while off-axis properties were not. Off-axis loading resulted in substantial reductions in tensile and fatigue strength in the commercially pure matrix material. Although failure in tensile overload occurred along the weak fiber/matrix interface in off-axis specimens, subcritical fatigue cracks propagated parallel to the fiber direction but through the matrix. The fractographic appearance of these cracks is simular to cyclic cleavage along slip planes. The critical stress intensity for unstable fracture of off-axis material was controlled by a combination of the normal and shear stress components acting on the fiber/matrix interface. The alloying conditions in ZE41A resulted in a slight decrease in axial properties accompanied by a significant improvement in off-axis behavior. These differences were found to be a result of improved matrix and interface strengths and a decrease in fiber strength. GRA

N84-31295# California Univ., Livermore. Lawrence Livermore Lab.
QUALITY-ASSURANCE TESTS OF FIVE Y-12 KEVLAR-49 SPOOLS USED TO FABRICATE STRANDS AND RELIABILITY SPECIMENS FOR STRESS-RUPTURE TESTS
L. E. Caley, P. K. Ambalal, J. F. Carley, T. S. Ford, R. L. Moore, D. J. Noecker, M. E. Ross, R. J. Sherry, and J. M. Yoshiyama 7 May 1984 63 p refs
(Contract W-7405-eng-48)
(DE84-012373; UCID-20078) Avail: NTIS HC A04/MF A01

An important component of the composite reliability program is the assurance of quality of Kevlar 49, 380-denier yarn and epoxy-impregnated yarn. This yarn, which is used in the fabrication of W-82 components from Kevlar 49/epoxy composites, is also formed into test specimens for long term, stress-rupture studies and reliability studies. The QA work covered encompasses preparation of impregnated-yarn specimens, examination of the yarn itself and individual fibers therefrom, tensile testing of bare and impregnated yarns and heat-degraded yarns. The yarn samples were all drawn from spools of 380-denier Kevlar 49 shipped to LLNL from Y-12. The resin matrix is an amine-hardened epoxy with low viscosity and long pot life, intended for filament winding. The components are Dow epoxy resins (DER) 332 and Jeffamine T-403 triamine hardener. The stoichiometric combining ratio is 100 parts by weight resin to 44 parts hardener. Quality-assurance testing not only verifies that the yarns actually meet the manufacturer's specifications, but also provides data on

the relationships between fiber characteristics and the lifetime reliability of fabricated items. DOE

N84-31296# Rockwell International Corp., Golden, Colo. Energy Systems Group.
A COMPREHENSIVE GUIDE TO THE LITERATURE ON ACOUSTIC EMISSION FROM COMPOSITES
Thomas F. Drouillard and Marvin A. Hamstad Livermore, Calif. California Univ., Lawrence Livermore Lab. 16 Apr. 1983 63 p refs Presented at the 1st Intern. Symp. on Acoustic Emission from Reinforced Composites, San Francisco, 19-21 Jul. 1983 Submitted for publication
(Contracts DE-AC04-76DP-03533; W-7405-eng-48)
(DE84-011064; UCRL-88273; CONF-830755-2; RFP-3463; CP-23) Avail: NTIS HC A04/MF A01

A comprehensive bibliography was compiled on the subject of acoustic emission (AE) from composites. More than 300 references are presented. To facilitate usage of this bibliography, author and subject indexes were developed to help the user easily find significant references in different areas of interest. Also listed are the organizations and authors where the major research, development, and application of acoustic emission from composites was performed. All references are rated by the approximate percentage of the reference devoted to acoustic emission from composites. The format provides documentation to and the user in the search for pertinent material in a particular area of interest. DOE

N84-31297# Oak Ridge National Lab., Tenn.
IMPROVEMENTS IN MECHANICAL PROPERTIES IN SIC BY THE ADDITION OF TIC PARTICLES
G. C. Wei and P. F. Becher 1984 21 p refs Presented at the 86th Ann. Meeting and Exposition of the American Ceramic Society, Pittsburgh, 29 Apr. 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE84-012352; CONF-840440-1) Avail: NTIS HC A02/MF A01

Silicon carbide ceramics containing up to 24.6 vol% of dispersed TiC particles yielded fully dense composites by hot pressing at 2000(0)C with 1% Al and 1% C added. The microstructure consists of fine TiC particles in a fine grained SiC matrix. Addition of TiC particles increases the critical fracture toughness of SiC (to approx. 6 MPa m/sup 1/2/ at 24.6 vol % TiC) and yields high flexure strength (greater than or equal to 680 MPa), with both properties increasing with increasing volume fraction of TiC. The strengths at elevated temperatures are also improved by the TiC additions. It is indicated that the improved toughness and strength are a result of crack deflection by the TiC particles. DOE

N84-31298# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Laboratoire Central.
INVESTIGATION OF DAMAGE AND DAMAGE PROPAGATION IN STATIC AND FATIGUE TESTS ON CARBON EPOXY COMPOSITES [ETUDE DES ENDOMMAGEMENTS ET DE LEUR PROPAGATION EN ESSAIS STATIQUES ET DE FATIGUE SUR COMPOSITES CARBONNE EPOXY]
J. Odorico, J. Cuny, M. Vancon, F. Benedic, and B. Soulezelle 13 Mar. 1984 40 p ref In FRENCH Presented at 5th Colloq. Mech. et Metal., Tarbes, France, 14-16 Mar. 1984
(SNIAS-841-551-102; CN-46464) Avail: NTIS HC A03/MF A01

Tensile tests on flexible, holed carbon epoxy laminates are summarized. Damage evolution and means of tracing it (extensometers, X-rays, micrography, ultrasonics) were studied. Stresses were calculated as a function of loading. Breaking points were determined. Analysis shows that a wide scatter of results, even for a single test piece, is possible, and that mechanical tests must be accompanied by means to closely monitor crack initiation and propagation. Author (ESA)

N84-31299# Centre de Recherches sur les Macromolecules, Strasbourg (France).
NUCLEAR MAGNETIC RESONANCE (NMR) STUDY OF GLASS FIBER-EPOXY RESIN COMPOSITES IN THE SOLID STATE Final Report [ETUDE PAR RMN A L'ETAT SOLIDES DE RESINES ET COMPOSITES FIBRES DE VERRE RESINE EPOXY]
Gilbert Weill, Bernard Meurer, and Pierre Spegt 24 May 1984 48 p In FRENCH
(Contract DRET-81-34-029-00-470-75-01)
Avail: NTIS HC A03/MF A01

The suitability of nuclear magnetic resonance (NMR) techniques to assess the properties of glass fiber-epoxy resin composites and to measure the effects of thermomechanical preparation processes was investigated. Proton and C13 high resolution solid state NMR were used. The C13 resolution is not good enough. Study of the free precession signal as a function of temperature is suitable, and may be sensitive to interface quantity. Author (ESA)

N84-31300# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMPOSITE STRUCTURE REPAIR
Larry G. Kelly (AFWAL) Feb. 1984 24 p refs Presented at the 57th Meeting of the Structures and Materials Panel, Vimeiro, Portugal, 9-14 Oct. 1983
(AD-A141456; AGARD-4-716; ISBN-92-835-1466-1) Avail: NTIS HC A02/MF A01 CSCL 11/4

The technology for advanced composite structure repair is presently in a developing stage. The boundaries and limitations of bolted versus bonded repairs and precured patches versus cocured in place patches and their applicability to various types of hardware has yet to be clearly established. This paper does not discuss step by step repair procedures for specific aircraft components, such as defined in repair technical orders, but rather provides general guidelines for repair concepts and discusses two repair configurations that are generic in nature; an external patch and a near flush repair and the extent to which they have been verified in the U.S. These repairs are applicable to a wide variety of light to moderately bonded (up to 25,000 lb/inch) stiffened and honeycomb sandwich structure sustaining damage over a reasonably large area (up to 100 sq. in.) Also provided are references to documents containing step by step procedures for these repair techniques and identification of organizations in the U.S. actively engaged in advanced composite structure repair. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-31301 British Library Lending Div., Boston Spa (England).
ANALYTICAL METHODS FOR DETERMINATION OF INORGANIC ANIONS
Bernd Roessner and Georg Schwedt 16 Mar. 1984 7 p refs Transl. into ENGLISH from Fresenius Z. fuer Anal. Chem. (West Germany), no. 315, 1983 p 197-200
(BLL-WH-592-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The application of the Fe(II)Hg-tripyridyl-s-triazine system for photometric trace analysis of chloride in the range from 10 microgram/1 ro 10 mg/1 is shown. The improvement of the method for optimum results leads in the continuous flow method to be a detection limit of 5 microgram/1. A manual method for the range from 1 - 10 microgram/1 is also given. The determinations of chloride in natural waters, p a salts, a bitumen sample and air are described as examples of applications. R.J.F.

N84-31302# Cranfield Inst. of Tech., Bedfordshire (England).
QUASI-STEADY FLAMES ON AN EVOLVING ATMOSPHERE
J. F. Clarke Feb. 1984 20 p refs
(CAR-8406; ISBN-0-947767-02-9) Avail: NTIS HC A02/MF A01

Theoretical studies of pre-mixed flames are complicated by the fact that the atmosphere ahead of the combustion wave is essentially in a state of disequilibrium. Various devices have been

proposed to overcome this difficulty. A model is proposed that admits from the outset that the basic atmosphere will be undergoing temporal changes, at least. The flame is superimposed upon them in a manner that allows it to be treated as a quasi-steady combustion wave whose slow evolution is shown to be linked directly with that of the ambient atmosphere itself. The flames are shown to have structures that cover the whole spectrum of possibilities from convection-reaction balances to the conventional thermal-flame-type of wave. S.B.

N84-31303# Argonne National Lab., Ill.
HIGH-RESOLUTION SPECTROSCOPY AND DYNAMICS OF MULTIPHOTON PROCESSES IN ATOMS AND MOLECULES Annual Summary Report, 1 Oct. 1983 - 30 Sep. 1984
P. M. Dehmer and J. L. Dehmer 2 Jul. 1984 16 p
(Contract N00014-84-F-0017; RR0-1103)
(AD-A143017) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report summarizes research on resonantly enhanced multiphoton absorption, dissociation, and ionization processes in atoms and molecules. Multiphoton processes are studied using from one to three independently tunable visible and/or UV laser beams in order to establish both the underlying physics and the high degree of selectivity of multiphoton processes. Measurements are made to probe both the formation of excited molecular states and the subsequent behavior of excited states either in the presence or in the absence of further intense laser radiation. Detection methods include laser-induced fluorescence, ion mass analysis, and electron kinetic energy analysis. During the current reporting period, we have studied resonant multiphoton ionization processes in H2 and N2, and have demonstrated that, in certain cases, it is possible to produce rotationally, vibrationally, and electronically state selected ions with greater than 95% purity. GRA

N84-31304# Polytechnic Inst. of New York, Farmingdale. Dept. of Chemistry.
KINETICS OF COMPLEXATION OF THE MACROCYCLES 18C6 AND 12C4 ETHERS WITH LiAsF-6 IN 1,2-DIMETHOXYETHANE AT 25 DEG C Technical Report
H. Richman, Y. Harada, and S. Petrucci Jun. 1984 18 p
(Contract DAAG29-82-K-0048)
(AD-A143086; TR-5; ARO-18978.5-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Ultrasonic relaxation spectra of the systems LiAsF6 added to the macrocycles 18C6 or 12C4 ethers, in molar ratio R approx. = 1, in the solvent 1,2-Dimethoxyethane (DME) at t=25 deg C are reported. The concentration range covered was 0.05 to 0.25M for 18C6 and 0.1 to 0.3M for 12C4. Ancillary electrical conductance data reveal that the lithium-macrocycle interaction is weak, the conductance data being the same up to approx. 10 to the -2M, within experimental error of the one for the electrolyte in DME. GRA

N84-31305# Howard Univ., Washington, D. C. Dept. of Chemistry.
TEMPERATURE DEPENDENCE OF THE RAMAN OH-STRETCHING OVERTONE FROM LIQUID WATER
W. B. Monosmith and G. E. Walrafen 27 Jun. 1984 7 p Submitted for publication
(Contract N00014-80-C-0305; NR Proj. 051733)
(AD-A143131; TR-19-ONR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The first Raman overtone of the OH-stretching vibration from highly purified liquid water has been examined quantitatively in the temperature range of 20-95 deg C, and at frequencies from about 5500-8000/cm. Author (GRA)

N84-31306# School of Aerospace Medicine, Brooks AFB, Tex.
TOTAL AEROSOL VOLUME COMPUTED FROM LASER SPECTROMETER PARTICLE-SIZE DATA FOR COMPARISON WITH FLAME PHOTOMETER TOTAL-MASS DATA Final Report, 15 Jun. - 30 Sep. 1983
I. S. Goldberg and A. R. Laird Jun. 1984 12 p
(AF Proj. 2729)
(AD-A143171; USAFSAM-TR-84-23) Avail: NTIS HC A02/MF A01 CSCL 14/2

A computer program that converts laser spectrometer (LAS-X) particle-size data to total aerosol volume has been developed. Sources of errors and uncertainties in LAS-X data have been evaluated. Because aerosol volume is directly proportional to mass, the derived aerosol volumes can be compared with sodium chloride (NaCl) aerosol-mass data from a flame photometer. Author (GRA)

N84-31307# TRW Defense and Space Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.
WALL QUENCH AND FLAMMABILITY LIMIT EFFECTS ON EXHAUST HYDROCARBON EMISSION Final Technical Report, 1 Mar. 1983 - 28 Feb. 1984
Francis Fendell Jan. 1984 8 p
(Contract DE-AC04-78ET-13329)
(DE84-009754; DOE/ET-13329/T2) Avail: NTIS HC A02/MF A01

Lean-burn operation of Otto-cycle-type automotive were investigated. The areas are: achievement of knock free performance, both under available fuels and current compression ratios and under higher octane fuels and higher compression ratio design; and identification of counterstrategies for two wall quenching of flame propagation, a phenomenon which is acknowledged to be the major source of unburned hydrocarbon emissions exhausted from homogeneous charge cylinders. DOE

N84-31308# Northwestern Univ., Evanston, Ill. Dept. of Chemical Engineering.
MECHANISTIC STUDIES OF CATALYTIC METHANOL SYNTHESIS Final Report
H. H. Kung Mar. 1984 30 p refs
(DE84-008380; DOE/PC-30239/T4) Avail: NTIS HC A03/MF A01

The catalytic methanol production on a Cu-Zn-oxide catalyst was studied at 17 atm and about 200 C in a batch reactor. The initial rate measurement was performed for different CO2/CO ratios in the feed. The rate was found to increase with increasing CO2/CO, for a fixed H2 partial pressure. This behavior was observed for catalysts at different stages of deactivation, and from 195 to 225 C. Thus under the conditions of initial rate measurements, the water-gas shift reaction is rapid. The relative rates of hydrogenation of CO2 and CO were also determined near chemical equilibrium by the relaxation method. Nonequilibrium thermodynamic theories were applied to describe the relaxation process. The physical meaning of the equilibrium exchange rate for a complex reaction was discovered. A method was developed to measure the equilibrium exchange rates of the simultaneous reactions in methanol synthesis. DOE

N84-31309# Oak Ridge National Lab., Tenn.
COMPARATIVE STUDIES OF VAPOR AND LIQUID-PHASE IMPREGNATION OF POROUS SILICON NITRIDE AND SILICON CARBIDE MATERIALS Ph.D. Thesis - Karlsruhe Univ., Oct. 1981
H. Strohmeier 1984 159 p refs Transl. into ENGLISH from German thesis
(DE84-012867; ORNL-tr-5117) Avail: NTIS HC A08/MF A01

The preparation of dense Si3N4 and SiC bodies without using foreign additives in order to avoid their negative effect on creep above 1000 C was examined. Although stress-free bodies are produced by reaction sintering, they are highly porous and post-densification is only achieved by impregnation. Silicon nitride produced by reaction bonding was impregnated with polysilanes and then subjected to pressure pyrolysis. Densification by chemical vapor deposition was also investigated. It is concluded that the goals of densification, solidification, reduction of creep rate, and improvement of oxidation resistance were attained. DOE

N84-31310# California Univ., Berkeley. Lawrence Berkeley Lab.
NEW APPROACHES TO PHOTOTHERMAL SPECTROSCOPY
N. M. Amer 23 Jul. 1984 5 p refs Presented at 3rd Intern.

Conf. on Infrared Phys., Zurich, 23 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE84-009237; LBL-17390; CONF-840725-2) Avail: NTIS HC A02/MF A01

The principles of photothermal deflection spectroscopy and photothermal displacement spectroscopy are described. The small rise in temperature associated with the absorption of light has provided the basis for a new class of spectroscopy which is called photothermal spectroscopy. The more familiar member of this family was photoacoustic spectroscopy where the optical heating is converted into sound and is detected with a suitable transducer. This approach is useful yet the ultimate sensitivity of photoacoustics is limited by the scattering of light on the transducer. In experiments requiring a wide range of temperatures and pressures, or hostile environment, both microphone and piezoelectric photoacoustic detections cannot be employed. To overcome these limitations the optical heating has to be exploited in different ways. DOE

N84-31311# Sandia Labs., Albuquerque, N. Mex.
STRETCH EFFECTS IN PLANE PREMIXED HYDROGEN-AIR FLAMES
J. Warnatz (Heidelburg Univ.) and N. Peters (Technische Hochschule, Aachen, West Germany) Apr. 1984 27 p refs
(Contract DE-AC04-76DR-00789)
(DE84-012035; SAND-84-8220) Avail: NTIS HC A03/MF A01

A plane premixed flame with detailed kinetics which is stretched by a diverging flow field was analyzed. The numerical results are compared to the analytic result obtained from large activation energy asymptotics for one step kinetics. A rich flame with a hydrogen mole fraction in the unburnt of X/sub H2/ = 0.6 and a lean flame with X/sub H2/ = 0.15 are considered. The mass flow rate through the flame is decreased due to stretch for the rich flame, while it is increased for the lean flame. Extinction occurs due to flame stretch for the rich and due to flame compression for the lean flame. DOE

N84-31312# Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
SUPERCRITICAL AND CHROMOTOGRAPHY/SUPERSONIC JET SPECTROSCOPY Progress Report, 1 Feb. - 30 Apr. 1984
M. L. Lee and S. R. Goates May 1984 20 p refs
(Contract DE-FG22-83PC-60807)
(DE84-012124; DOE/PC-60807/3) Avail: NTIS HC A02/MF A01

Preliminary testing of the supercritical fluid extraction/fractionation equipment has been started. Restrictor dimensions necessary for a wide range of flow rates and pressures have been calculated. Operation of the mass spectrometer in the chemical ionization and electron impact modes when coupled to the supercritical fluid chromatograph was investigated. The best performance (low background noise and increased sensitivity for high molecular weight compounds) was obtained under chemical ionization conditions. Two vacuum stillbottoms samples were analyzed by supercritical fluid chromatography on an n-octylpolysiloxane stationary phase and with fluorescence detection. Construction and preliminary testing of the supersonic jet detection system is well underway. DOE

N84-31313# Oak Ridge Gaseous Diffusion Plant, Tenn. Analytical Chemistry Dept.
DETERMINATION OF EVAPORATION RATES OF ORGANIC SOLVENTS BY THIN-FILM EVAPOROMETER
A. K. Headrick May 1984 17 p
(Contract DE-AC05-84OT-21400)
(DE84-012308; K/PS-773) Avail: NTIS HC A02/MF A01

An automatic thin-film evaporometer was used to determine evaporation rates of volatile organic solvents. The instrument measures weight loss as a function of time under specific environmental conditions. The method, ASTM D 3539, is limited only in that the sample should not be too viscous so as to allow dispensing with a syringe. The rate of evaporation can be valuable information in optimizing processes involving application of materials containing volatile solvents. DOE

N84-31314# Pennsylvania State Univ., University Park. Dept. of Chemical Engineering.
CRYSTALLITE SIZE AND SUPPORT EFFECTS ON CO HYDROGENATION REACTIONS Final Progress Report, 1 Jan. 1982 - 30 Aug. 1984
M. A. Vannice Feb. 1984 17 p refs
(Contract DE-AC02-77ER-04463)
(DE84-012474; DOE/ER-04463/7) Avail: NTIS HC A02/MF A01

The TiO2 supported Pd was found to be the most active Pd methanation catalyst yet reported. The IR studies showed that almost no IR active CO was present on the Pd surface during reaction. Surface concentrations of IR active CO were barely detectable under reaction conditions. Both H2 and CO chemisorption measurements were conducted on these catalysts. The surface concentrations of CO under reaction conditions indicated that only a small fraction of the TiO2 supported metal surface is covered by CO. A modified model for the methanation reaction is proposed, and it is found that only a small fraction of the surface metal atoms constitute active sites which create these higher activities. DOE

N84-31315# Princeton Univ., N. J. Dept. of Chemistry.
CHEMICAL POISONING IN MODEL HETEROGENEOUS REACTIONS Final Report, 1 May 1977 - 30 Apr. 1983
S. L. Bernasek Apr. 1984 8 p refs
(Contract DE-AC02-77ER-04341)
(DE84-012461; DOE/ER-04341/6) Avail: NTIS HC A02/MF A01

Over the period work developed mainly in three areas: molybdenum surface chemistry, molybdenum oxide surface chemistry, and the development of transition metal compounds as models for chemical poisoning. The effect of sulfur on the existence and stability of surface structures of platinum may have important implications for the microscopic understanding of the mechanism of chemical poisoning on transition metal surfaces. DOE

N84-31316# Ames Lab., Iowa.
VERSATILITY OF LASER INDUCED FLUORESCENCE LINE NARROWING IN CHEMICAL ANALYSIS
M. J. McGlade, J. M. Hayes, G. J. Small, V. Heisig, and A. M. Jeffrey 1983 6 p refs Presented at ORNL-DOE Conf. on Analytical Chem. in Energy Technol., Knoxville, Tenn., 11 Oct. 1983
(Contract W-7405-eng-82)
(DE84-012834; IS-M-469) Avail: NTIS HC A02/MF A01

Laser excited fluorescence line narrowing spectroscopy (FLNS) in organic glasses at low temperatures was shown to be a high sensitivity and resolution technique for the analysis of polycyclic aromatic hydrocarbons (PAH) in real samples. The versatility of FLNS is underscored by application to amino-PAH, PAH metabolites and aromatic carcinogen-DNA adducts. DOE

N84-31317# Los Alamos Scientific Lab., N. Mex.
HYDROGEN TRANSPORT, MIXING, AND COMBUSTION STUDIES
J. R. Travis 1984 16 p refs Presented at the IAEA Tech. Comm. Workshop on the Uses of Computer Codes for Nucl. Reactor Safety Analysis, Varna, Bulgaria, 29 May - 1 Jun. 1984
(Contract W-7405-eng-36)
(DE84-012455; LA-UR-84-1649; CONF-8405164-2) Avail: NTIS HC A02/MF A01

The transport, mixing, and burning of hydrogen inside containments are discussed. Detailed models describing these important phenomena are given, as well as several example calculations to show the versatility and accuracy of the methods. DOE

N84-31318# Oak Ridge National Lab., Tenn. Chemical Physics Section.
CONCEPTUAL BASIS OF RESONANCE IONIZATION SPECTROSCOPY
M. G. Payne Apr. 1984 9 p refs Presented at the 2nd Symp. on Resonance Ionization Spectry. and its Appl., Knoxville, Tenn., 16-20 Apr. 1984 Sponsored in part by Martin Marietta Energy Systems, Inc.

(Contract DE-AC05-84OR-21400)
(DE84-011662; CONF-840449-5) Avail: NTIS HC A02/MF A01

Resonance Ionization Spectroscopy (RIS) can be defined as a state selection detection process in which tunable lasers are used to promote transitions from the selected state of the atoms or molecules in question to higher states, one of which will be ionized by the absorption of another photon. At least one resonance step is used in the stepwise ionization process, and it was shown that the ionization probability of the spectroscopically selected species can nearly always be made close to unity. Since measurements of the number of photoelectrons or ions be made very precisely and even one electron (or under vacuum conditions, one ion) can be detected, the technique can be used to make quantitative measurements of very small populations of the state selected species. Counting of individual atoms has special meaning for detection of rare events. The ability to make saturated RIS measurements opens up a wide variety of applications to both basic and applied research. RIS is viewed as a specific type of multiphoton ionization in which the goal is to make quantitative measurements of quantum selected populations in atomic or molecular systems. DOE

N84-31319# Oak Ridge National Lab., Tenn. Chemical Physics Section.
HISTORICAL SURVEY OF RESONANCE IONIZATION SPECTROSCOPY
G. S. Hurst Apr. 1984 12 p refs Presented at the 2nd Symp. on Resonance Ionization Spectry. and its Appl., Knoxville, Tenn., 16-20 Apr. 1984 Sponsored in part by Martin Marietta Energy Systems, Inc.
(Contract DE-AC05-84OR-21400)
(DE84-011654; CONF-840449-7) Avail: NTIS HC A02/MF A01

The history of Resonance Ionization Spectroscopy is given. Basically, RIS is a photophysics process in which tunable light sources are used to remove a valence electron from an atom of selected atomic number, Z. If appropriate lasers are used as the light source, one electron can be removed from each atom of the selected Z in the laser pulse. This implies that RIS can be a very efficient, as well as selective, ionization process. In what we normally call RIS, laser schemes are employed which preserve both of these features. In contrast, multiphoton ionization (MPL) is more general, although not necessarily Z selective or very efficient because resonances are often not used. Early research completed in the USSR and described as selective two step photoionization, employed resonances to ionize the rubidium atom and served to guide work on laser isotope separation. DOE

N84-31320# Oak Ridge National Lab., Tenn. Chemical Physics Section.
ISOTOPICALLY SELECTIVE COUNTING OF NOBLE GAS ATOMS, USING RESONANCE IONIZATION SPECTROSCOPY
C. H. Chen Apr. 1984 7 p refs Presented at the 2nd Intern. Symp. on Resonance Ionization Spectry. and its Appl., Knoxville, Tenn., 16-20 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE84-011638; CONF-840449-9) Avail: NTIS HC A02/MF A01

The technique of Resonance Ionization Spectroscopy (RIS) is extended to develop a means for counting individual atoms of a selected isotope of a noble gas. In this method, lasers are used for RIS to obtain atomic species (Z) selectivity and a small quadrupole mass spectrometer provides isotopic (A) selectivity. A progress report on the objective of counting each atom of a particular isotope of a noble gas is given. DOE

N84-31321# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
USE OF SURFACE AND THIN FILM ANALYSIS TECHNIQUES TO STUDY METAL-ORGANIC AND METAL-POLYMER INTERACTION
H. G. Tompkins 1984 27 p refs Presented at the Intern. Conf. on Met. Coatings, San Diego, Calif., 9 Apr. 1980
(Contract DE-AC07-76ID-01570)
(DE84-012542; EGG-M-21683; CONF-8404135-3) Avail: NTIS HC A03/MF A01

Very thin organic or polymer films can be analyzed using several analytic techniques. The thickness of the films discussed ranges from monolayers to several thousand angstroms thick. The techniques described are X-ray photoelectron spectroscopy, infrared spectroscopy, ellipsometry, and the quartz crystal oscillator microbalance. The latter technique is applied to a fluoropolymer deposited on a silver surface. The parameters which control film thickness and uniformity are discussed along with measurement methods of these parameters. The second example discussed is the application of nitrogen containing organic molecules to copper and iron surfaces. The chemical bonding is discussed along with the orientation of the molecules in the resulting film and the analytical techniques used. DOE

N84-31322# California Univ., Berkeley. Dept. of Mechanical Engineering.
DENSITY FLUCTUATIONS IN PREMIXED TURBULENT FLAMES
M. Namazian, L. Talbot, and F. Robben (California Univ., Berkeley, Lawrence Berkeley Lab.) Mar. 1984 21 p refs Presented at the 20th Intern. Symp. on Combustion, Ann Arbor, Mich., 12 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-012055; LBL-17666; CONF-840801-13) Avail: NTIS HC A02/MF A01

The simultaneous two-point density fluctuations in a V-shaped turbulent flame are measured using a two-point Rayleigh scattering method. A wrinkle laminar flame model with finite instantaneous flame thickness is developed for the flames studied. The reaction front probability density function (pdf) is both measured directly and also calculated from the measured mean density. An analytical expression for this pdf is given which is derived based on a thin flame model. The mean, rms and correlation coefficients are calculated using the finite reaction front thickness model and the results are compared with the experimental data. The pdf of the intermediate states are shown to be due to the reaction front thickness. DOE

N84-31323# Los Alamos Scientific Lab., N. Mex.
CHEMICAL KINETICS IN HYDROGEN-AIR FLAMES
J. H. Sullivan Apr. 1984 24 p refs
(Contract W-7405-eng-36)
(DE84-011002; LA-10019-MS) Avail: NTIS HC A02/MF A01

This report describes a chemical reaction mechanism for hydrogen air flames. The mechanism includes the minimum number of elementary reactions that are necessary to reproduce macroscopic flame properties. The elementary reactions, their rate coefficients, and a qualitative description of their contributions to the structure of the flame are given. It is suggested that the flammability limits are determined primarily by the chemical kinetics, but the lean flammability limit is extended further into the lean region by preferential diffusion of hydrogen gas into the flame. DOE

N84-31324# Argonne National Lab., Ill.
USE OF PULSE RADIOLYSIS TO MEASURE HIGH TEMPERATURE KINETICS
C. D. Jonah, W. A. Mulac, and M. F. Beno 4 Sep. 1984 4 p refs Presented at 20th Intern. Symp. on Combust., Ann Arbor, Mich., 12 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-011702; CONF-840801-12) Avail: NTIS HC A02/MF A01

Rate constants for OH + CO, OD + CO and OH + CH4 were measured from room temperature to 1250 k. The dependence of the OH + CO rate on the amount of water vapor in the system were determined at selected temperatures from room temperature to 1230 k. DOE

N84-31325# California Univ., Berkeley. Lawrence Berkeley Lab.
CATALYZED PHOTODISSOCIATION OF WATER
G. A. Somorjai, M. Hendewerk, and J. E. Turner Jan. 1984 43 p refs Presented at 2nd Berkeley Catalysis and Surface Sci. Conf.,

Berkeley, Calif., 11 Jan. 1984
(Contract DE-AC03-76SF-00098)
(DE84-012253; LBL-17623; CONF-840102-1) Avail: NTIS HC A03/MF A01

The dissociation of water to hydrogen and oxygen requires energy of (DELTA) G298 = 228 kJ/mole. By irradiating a semiconductor with light of energy greater than this amount, one may produce electrons in the excited state and electron vacancies at the surface that can perform the photochemical reduction (2H(+) + 2e(-) (YIELDS) 2H (YIELDS) H2) and oxidation (2OH(-) + 2+ (YIELDS) H2O2 (YIELDS) H2O + (1/2)O2). There are several semiconductors, SrTiO3, TiO2, CdS, and Fe2O3 among them, that can photodissociate water. Some possess sites for both reduction and oxidation, while others carry out the two processes at different surfaces. A reversible solid state reaction that involves changes in the transition metal and ion oxidation state must accompany the splitting of water. Platinum, rhodium, and ruthenium oxide, when deposited on the semiconductor, serve as catalysts that accelerate the water photodissociation. These additives accelerate the recombination of hydrogen and oxygen atoms, shift the semiconductor Fermi level to a more favorable position that improves the thermodynamic feasibility for the process, accelerate electron transport, and inhibit side reactions like the photoreduction of oxygen. Many of the elementary reaction steps leading to photoproduction of hydrogen and oxygen over SrTiO3 and Fe2O3 are identified and discussed. DOE

N84-31326# California Univ., Livermore. Lawrence Livermore Lab.
ANALYSIS OF MOISTURE IN SOLIDS: A REVIEW OF THE LAST DECADE OR FROM PANDE TO THE PRESENT
J. W. Pyper 15 Sep. 1983 25 p refs
(Contract W-7405-eng-48)
(DE84-011166; UCRL-53447) Avail: NTIS HC A02/MF A01

The scientific literature published since A. Pande's comprehensive monograph Handbook of Moisture Determination and Control (1974) was surveyed (to mid-1983) for new or improved techniques of analyzing moisture in solids. Particular focus was on methods that might distinguish between bound and free moisture in organic solids. The classification of moisture is discussed, as well as pitfalls in sampling, in sample handling, and in the comparison of different methods. Four methods that show promise of being able to distinguish between bound and free moisture were identified: dielectric spectrometry, coherent microwave analysis, near-infrared reflectance analysis (NIRA), and nuclear magnetic resonance spectroscopy (NMR). DOE

N84-31327# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
VIBRATIONAL SPECTRA OF CO ON Ni(100) STUDIED BY INFRARED EMISSION SPECTROSCOPY
S. Chiang, R. G. Tobin, P. L. Richards, and P. A. Thiel Feb. 1984 6 p refs Presented at the 3rd Intern. Conf. of Infrared Phys. (CIRP 3), Zurich, 23-27 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE84-009246; LBL-17294-Summ; CONF-840725-4-Summ) Avail: NTIS HC A02/MF A01

The technique of infrared emission spectroscopy has been developed in order to observe vibrational modes of molecules adsorbed on clean, single crystal metal surfaces. A novel apparatus has been constructed which measures the emission from a single crystal sample in thermal equilibrium at room temperature. The apparatus consists of a liquid helium cooled infrared grating spectrometer coupled to an ultrahigh vacuum system equipped with surface preparation and characterization facilities. DOE

N84-31328# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DEHYDRATION OF ALUMINUM CHLORIDE HEXAHYDRATES: A TECHNICAL ASSESSMENT
R. L. Miller Apr. 1984 48 p refs
(Contract DE-AC07-76ID-01570)
(DE84-013086; EGG-SCM-6567) Avail: NTIS HC A03/MF A01

Physical and chemical properties of aluminum chloride hexahydrate, ACH, and related compounds are noted as well as the relation of these properties to the problem of dehydration of ACH to form anhydrous aluminum chloride. Several approaches to the dehydration of ACH are discussed and a rationale or each approach is given: solvent extraction, ligand exchange, azeotropic distillation, chemical dehydration, and energy specific direct heating. While the thermodynamics of dehydration ae frequently favorable, the rate of reaction and the mechanisms of reaction are more frequently unfavorable. However, each approach requires experimentation to test its effectiveness. The stability of the aluminum-oxygen bond in the hydrate is such that dehydration without decomposition to the oxide will be very difficult. DOE

N84-31329# TRW Space Technology Labs., Redondo Beach, Calif.
RAMAN SPECTROSCOPY MEASUREMENTS OF FLAME QUENCHING IN A DUCT-TYPE CREVICE, APPENDIX B
P. W. Fairchild, R. D. Fleeter, and F. E. Fendell 1984 25 p refs Presented at the 20th Intern. Symp. on Combustion, Ann Arbor, Mich. 12-17 Aug. 1984
(Contract DE-AC04-78ET-13329)
(DE84-009328; CONF-840801-9) Avail: NTIS HC A02/MF A01

Flame/wall interactions in a duct type crevice were investigated by Raman scattering measurements of the spatial temperature profile for a range of wall separations and flame stoichiometry. Experiments using both cold and hot walls in an atmospheric pressure premixed propane/air flame show that as the wall separation is reduced opposite quench layers begin to interact. The effect is more severe for the leaner fuel mixtures where the flame speed is reduced. The hot wall shows the reduced quench layer thickness that is associated with the flame front position moving closer to the wall. DOE

N84-31330# Air Products and Chemicals, Inc., Allentown, Pa.
STUDY OF THE KINETICS OF HYDROGENATION USING AGED CATALYSIS Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1983
Frank K. Schweighardt Feb. 1984 24 p refs
(Contract DE-FG22-83PC-60783)
(DE84-006588; DOE/PC-60783/2) Avail: NTIS HC A02/MF A01

Design and construction of the special high pressure autoclave reactor with catalyst basket, unique sample feed and automated sample collection system are in progress by outside contractors. Performance testing of the total reactor system will be delayed 70 days of construction delays by Autoclave Engineers and relocation of the new high pressure safety cell required special modifications to allow for a safe operation. Chemical reactants (model polynuclear aromatic hydrocarbons) have been selected, ordered and received. Extensive chemical characterization of the reactants is underway to define purity levels. Samples will undergo recrystallization or sublimation to achieve 99.5% single isomer purity. Catalyst material has been received from J. Gough, Manager, Wilsonville Coal Liquefaction Facility. Other catalyst material has been defined and requested from H. Schlinder, CE Lummus Company and Wilsonville. A number of reaction solvents for the kinetic study are under evaluation. DOE

N84-31331# Centre Technique des Industries Mecaniques, Nantes (France).
DEVELOPMENT OF NORMALIZED OPERATIVE MODE FOR MAKING DEPOSITS FOR CHEMICAL ANALYSIS IN MIG/MAG WELDING Final Report [MISE AU POINT D'UN MODE OPERATOIRE NORMALISE D'EXECUTION DE DEPOTS POUR ANALYSE CHIMIQUE EN SOUDAGE MIG/MAG]
D. Beaufils (Institut de Soudure) 22 Feb. 1983 72 p refs In FRENCH
(CETIM-I.S.13.826) Avail: NTIS HC A04/MF A01

Weld deposits were created on molds of types subject to MIG/MAG welding to see if these deposits could be used for chemical analysis of the mold section normally used in mechanical tests, thereby avoiding the cost of a mold for each test. Deposits created under gas protection have chemical compositions nearest

that of molds, but the differences are too great to allow implementation. However, deposits formed without protection reflect mold chemical structure to within 20% and can be used. Author (ESA)

N84-31332# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
COMBUSTION OF REDOX MIXES IN THE THROUGH BULKHEAD INITIATOR (TBI) CONFIGURATION
R. Thivet (Societe Nationale des Poudres et Explosifs, Vert-le-Petit, France) and C. Mas 1984 7 p refs
(SNIAS-841-422-115) Avail: NTIS HC A02/MF A01

The stoichiometric mixes B/KNO3, Mg/CuO and Al/KC104 underwent standard firing tests. The shock and/or heat wave, resulting from the degradation of acceptor detonation in the shock attenuator, passes through the entire ignition powder bed before any appearance of combustion phenomena. The powder bed thus stressed appears to initiate in mass, implying the law of frontal combustion. The function time depends only on the particle size distribution and the specific area of the ingredients of the ignition powders. Ignition mix closure has no effect on through bulkhead initiator (TBI) performance, since the shock wave passing through the TBI tears off the closure disk by exfoliation before the onset of initiation. Author (ESA)

N84-31333# Battelle Columbus Labs., Ohio.
ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN PARTICULATE MATTER BY LUMINESCENCE TECHNIQUES Final Report
W. A. Ivancic, L. L. Brown, R. M. Riggin, and R. H. Barnes Apr. 1984 55 p refs
(Contract EPA-68-02-3487)
(PB84-181882; EPA-600/4-84-033) Avail: NTIS HC A04/MF A01 CSCL 07D

Fluorescence, phosphorescence, and heavy-metal activated room temperature phosphorescence spectra were obtained for ten polycyclic aromatic hydrocarbon (PAH) reference compounds individually and in mixtures on quartz plates and particulate matter. The direct analysis approach in combination with the use of solvent extraction followed by fluorescence analysis can provide a rapid means of analysis for PAHs both within and on the surface of particulate matter. Direct phosphorescence was too weak to be useful. Heavy metal activated room temperature phosphorescence appears more sensitive to matrix and substrate effects and less amenable to multicomponent analysis than fluorescence. The fluorescence spectra retains characteristic features that enable identification of the benzo(a)pyrene. GRA

N84-31334# SRI International Corp., Menlo Park, Calif.
REDUCTION OF CO2 TO METHANOL AND METHANE BY PHOTO AND DARK REACTIONS ON SEMICONDUCTOR ELECTRODES Annual Report, Feb. 1983 - Feb. 1984
K. W. Frese, Jr. and Duane Canfield Mar. 1984 65 p refs
(PB84-214360; GRI-84/0092) Avail: NTIS HC A04/MF A01 CSCL 07D

The electrochemical mechanism of reduction of CO2 or carbonate species to useful fuels, e.g., methanol and methane by means of sunlight and semiconductor electrodes is discussed. Carbon dioxide is an abundant raw material that may be used as a source of inorganic carbon. By suitable electrochemical processes this inorganic carbon may be converted to organic carbon in the form of methanol and methane, which could be used as fuel. Such electrochemical conversions can be made to occur at semiconductor electrodes. In addition, semiconductor electrodes absorb light, and this light can be converted to a voltage that causes the electrochemical transformations of interest. By combining the CO2, water, semiconductor, and sunlight, solar energy can be stored in the fuel. The end result is a method to upgrade the products of ordinary combustion, namely CO2 and H2O, by returning them to useful fuels. A study of the electrochemical and solid state aspects of the conversion of CO2 to fuels at semiconductor electrodes is discussed. GRA

N84-31335# Lenox Inst. for Research, Inc., Mass.
A MODIFIED STANDARD METHOD FOR THE DETERMINATION OF OZONE RESIDUAL CONCENTRATION BY SPECTROPHOTOMETRY Technical Report, 1982 - 1983
Lawrence K. Wang and Aimee E. Thayer 1 Aug. 1983 25 p refs Sponsored in part by Krofta Engineering Corp.
(PB84-204684; LIR/08-83/1) Avail: NTIS HC A02/MF A01 CSCL 07D

A new spectrophotometric method was developed for rapid and accurate determination of ozone residue in both the laboratory and the field. The new method uses identical chemical reagents required for ozone residue analysis by Standard Potassium Iodide method (a titration method) but needs no titration step once an ozone calibration curve is established. The basic principle involves the liberation of iodine from a potassium iodide solution in the presence of ozone residue. After an acidification step for fixation of the ozone content in solution the liberated iodine by ozone produces a yellow color. The degree of color intensity is proportional to the original ozone concentration in water, and can be measured spectrophotometrically. The range of ozone concentration measurable is from 0.03 to 6.0 mg/l. The new method has a precision of plus or - 1% for ozone concentrations of 3 mg/l or greater. GRA

N84-32040# Tokyo Denki Univ. (Japan).
HYDROGEN-BOND ENERGIES OF DIMER FORMATION AND UV ABSORPTION SPECTRA OF MONO-METHYL SUBSTITUTED 2-PYRIDONES
Akira Fujimoto and Kozo Inuzuka *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 51-62 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32076# Joint Publications Research Service, Arlington, Va.
CONDITIONS OF FILTRATION BURNING OF POROUS CONDENSED SYSTEMS WITH MULTIPLE PASSAGE OF REACTION WAVE Abstract Only
O. S. Rabinovich, S. N. Krasilshchikov, and I. G. Gurevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 130 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 46, no. 1, Jan. 1984 p 71-77 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-31336 Central Electricity Generating Board, London (England).
WEAR BEHAVIOUR OF STEEL UNDER THE ACTION OF GRANULAR INTERFACIAL MINERALS
O. Pigors 5 Apr. 1984 11 p Trans. into ENGLISH from Machinenbautech. (West Germany), v. 27, no. 3, 1978 p 109-111 (BLL-CE-Trans-8002-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

It was found that the appropriate use of materials subject to wear loading is always dependent on operating conditions. Low loads permit the use of carbon steels of the appropriate hardness. Since the wear characteristic of the steels is greatly dependent on carbon content, this should be selected to be not less than 0.50%. An economic increase in wear resistance of low-alloy steels is possible in particular by means of chromium manganese and molybdenum. Author

N84-31337 British Library Lending Div., Boston Spa (England).
USE OF THEORY OF SYSTEMS WITH DISPERSED PARAMETERS TO FORMULATE DEFORMATION RESISTANCE EQUATIONS IN PRESSURE WORKING OF METALS: COMMUNICATION 2
A. K. Grigorev and S. G. Fomin 26 Apr. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR), no. 8, 1983 p 22-26

(BLL-M-35595-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Probability characteristics are used to examine linear equations for the deformation resistance of semicrystalline bodies. The data in the equations are linearized to give various types of change pattern in deformation against time. The problems posed by experimental determination of the parameters of the linearized equations are examined. The probability characteristics of a number of metals are presented. Author

N84-31338 Illinois Univ., Urbana.
HIGH TEMPERATURE X-RAY DECOMPOSITION STUDIES OF ALPHA PHASE NICKEL-SILICON AND BETA PHASE COPPER-ALUMINUM-NICKEL ALLOYS Ph.D. Thesis
Michael Albert Dvorack 1984 197 p
Avail: Univ. Microfilms Order No. DA8409766

In situ high temperature X-ray diffraction studies were performed in order to study the transformation mechanisms and associated kinetics regarding the decomposition and precipitation processes of two metallic alloys of commercial significance Ni-12.5 at% Si and Cu-28.15 at% Al3.89 at% Ni. The X-ray results show that precipitation is dependent upon the thermal history of the specimen. Cyclic heating and cooling of the specimen at elevated temperatures alters the growth rate of the ordered phase. Growth of the ordered phase is simply based upon classical nucleation and growth phenomena. The Cu-Al-Ni shape memory alloy was studied with respect to both its thermal diffuse scattering and decomposition behavior. It was shown that diffuse streaks observed in diffraction patterns of this alloy are due to the presence of a thermally activated soft phonon TA sub 2 mode. Decomposition studies of this alloy have revealed that the gamma 2 brass phase appears from the initial beta 1 phase matrix at a peritectoid transition temperature of 275 C. The fcc alpha phase and orthorhombic gamma prime martensite phases also appeared.
Dissert. Abstr.

N84-31339 Rensselaer Polytechnic Inst., Troy, N. Y.
CORROSION FATIGUE OF AN Al-Zn-Mg ALLOY AND AN Al-Mg-Li ALLOY Ph.D. Thesis
Richard Edmond Ricker 1984 274 p
Avail: Univ. Microfilms Order No. DA8409517

Corrosion fatigue and related electrochemical experiments have been conducted on a high purity Al-Zn-Mg ternary alloy and a high purity Al-Mg-Li ternary alloy. The electrochemical experiments were performed in solutions of various concentrations of sodium chloride and sodium sulfate as functions of pH, temperature and degree of aeration. Thin sheets of the alloys were examined in strain controlled fatigue with controlled environmental conditons. Samples were heat treated to obtain the maximum tensile strength, electropolished, and stored in vacuum to remove absorbed hydrogen. Fatigue tests were performed in dry nitrogen gas as a reference environment, and compared with tests in humid nitrogen, distilled water, 0.5 molar sodium sulfate and 0.5 molar sodium chloride. The corrosion test results indicate that the corrosion potential of the Al-Mg-Li alloy are considerably more active than those of the Al-Zn-Mg alloy and that the pitting potentials are sightly more active. Therefore, while the lithium alloy pits more readily at the same potential in a given environment, the overpotential or energy required to induce pitting in the lithium containing alloy is greater than that required for Al-Zn-Mg alloys.
Dissert. Abstr.

N84-31340 Illinois Univ., Urbana.
PHASE TRANSFORMATIONS IN NEARLY STOICHIOMETRIC NICKEL-MANGANESE ALLOYS Ph.D. Thesis
Kenji Adachi 1983 278 p
Avail: Univ. Microfilms Order No. DA8409854

The transformation behavior of Ni-Mn alloys in the vicinity of the equiatomic composition was studied using transmission electron microscopy and diffraction, X-ray diffraction, optical microscopy, and electrical resistivity measurements. The transformation behavior was found to be markedly different comparing Mn-rich alloys and Ni-rich alloys. In Mn-rich alloys a martensitic transformation between the beta and theta phases takes place, while in Ni-rich alloys an order-disorder transformation between the gamma and theta phases takes place. The martensitic transformation proceeds both on quenching and on slow cooling from the beta region. However the martensite crystallography is nearly destroyed on slow cooling through a tempering process which involves the shrinkage of internal twins and the nucleation and growth of low-density twinned crystals along the variant-variant interfaces and grain boundaries.
Dissert. Abstr.

N84-31341 Ohio State Univ., Columbus.
TRANSFER DURING SLIDING WEAR OF SELECTED METAL SYSTEMS Ph.D. Thesis
Li-Hui Chen 1984 215 p
Avail: Univ. Microfilms Order No. DA8410369

It is well known that transfer, which affects friction and wear behavior dramatically, occurs in numerous sliding systems. In this dissertation, both experimental observations on transfer phenomena for selected metal systems (Fe vs, Cu, Cu-Ni, Ni and Mo) and theoretical predictions on transfer tendencies are emphasized. During pin-on-disk sliding tests transfer occurs as discrete particles (about several to 30 microns in size) initially. Lamellar structures are quite commonly observed in the transferred particles. The fragmentation process involved in the initial transfer events is probably a consequence of shear instability which occurs due to the applied normal load and friction forces. The initial transferred fragments are flattened, smeared and fractured by continued sliding and they begin to blend with pieces of base material. After prolonged sliding, transfer layers or patches build up on the sliding counterfaces. These layers or patches are composed of finely mixed materials derived from the two sliding counterparts as well as scattered pieces of newly transferred fragments. Typical wear debris come from the transfer layers or from transfer patches.
Dissert. Abstr.

N84-31342 Ohio State Univ., Columbus.
ENVIRONMENTALLY-CONTROLLED CRACK GROWTH RATE OF TYPE 304 STAINLESS STEEL IN HIGH TEMPERATURE SULFATE SOLUTIONS Ph.D. Thesis
Paul Chi-Keung Chung 1984 327 p
Avail: Univ. Microfilms Order No. DA8410371

The integranular crack growth rate of furnace-sensitized Type 304 stainless steel in a 0.01m sodium sulfate solution at 250 C has been measured using modified wedge-opening-loading (WOL) specimens loaded under constant deflection conditions at various applied potentials. It was found that the propagation of cracks occurred at potentials above-0.3 V sub she and that the crack growth rate increased with increasing potential. The critical potential for cracking is very close to that reported previously in the same environment for tests performed under constant straining conditions and under cyclic loading at low frequencies. The crack growth rate depends also on the value of the stress intensity factor (Ksub I) for K sub I lower than 20-25 MPa m(1/2), but it is almost independent of K sub I at higher K sub I values. The development of instrumented loading devices for the monitoring of load relaxation during crack growth is described, emphasizing the advantages of an inexpensive and compact internal instrumented bolt for measuring crack growth in a high temperature/high pressure environment.
Dissert. Abstr.

N84-31343*# Boeing Commercial Airplane Co., Seattle, Wash.
FLIGHT SERVICE EVALUATION OF TWO ALUMINUM-BRAZED TITANIUM SPOILERS
R. R. Boyer Aug. 1984 48 p refs
(Contract NAS1-13897)
(NASA-CR-172371; NAS 1.26:172371; D6-52046) Avail: NTIS HC A03/MF A01 CSCL 11F

The long-term service evaluation of two aluminum-brazed titanium (ABTi) honeycomb flight spoilers was concluded. The two spoilers had about 7.5 years of commercial flight experience on All Nippon Airways Model 737 aircraft. All Nippon Airways was selected because Japan has one of the most severe marine-industrial environments in the world. The results indicated that

both flight spoilers still had the same load-carrying capability as when they were originally installed. No direct evidence of any corrosion was observed on either spoiler. Another significant accomplishment of this effort was the development of a braze design for efficiently distributing point loads from the fittings and skin into the honeycomb core. Author

N84-31344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERLAY COATING DEGRADATION BY SIMULTANEOUS OXIDATION AND COATING/SUBSTRATE INTERDIFFUSION Ph.D. Thesis
James A. Nesbitt Aug. 1983 207 p refs
(Grant NAG3-244)
(NASA-TM-83738; E-2223; NAS 1.15:83738) Avail: NTIS HC A10/MF A01 CSCL 11F

Degradation of NiCrAlZr overlay coatings on various NiCrAl substrates was examined after cyclic oxidation. Concentration/distance profiles were measured in the coating and substrate after various oxidation exposures at 1150 C. For each stubstrate, the Al content in the coating decreased rapidly. The concentration/distance profiles, and particularly that for Al, reflected the oxide spalling resistance of each coated substrate. A numerical model was developed to simulate diffusion associated with overlay-coating degradation by oxidation and coating/substrate interdiffusion. Input to the numerical model consisted of the Cr and Al content of the coating and substrate, ternary diffusivities, and various oxide spalling parameters. The model predicts the Cr and Al concentrations in the coating and substrate after any number of oxidation/thermal cycles. The numerical model also predicts coating failure based on the ability of the coating to supply sufficient Al to the oxide scale. The validity of the model was confirmed by comparison of the predicted and measured concentration/distance profiles. The model was subsequently used to identify the most critical system parameters affecting coating life. B.W.

N84-31345*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-TEMPERATURE CYCLIC OXIDATION DATA, VOLUME 1
Charles A. Barrett, Ralph G. Garlick, and Carl E. Lowell May 1984 188 p
(NASA-TM-83665; E-1499; NAS 1.15:83665) Avail: NTIS HC A09/MF A01 CSCL 11F

This first in a series of cyclic oxidation handbooks contains specific-weight-change-versus-time data and X-ray diffraction results derived from high-temperature cyclic tests on high-temperature, high-strength nickel-base gamma/gamma' and cobalt-base turbine alloys. Each page of data summarizes a complete test on a given alloy sample. A.R.H.

N84-31346*# Cabot Corp., Kokomo, Ind.
DEVELOPMENT OF IMPROVED LOW-STRAIN CREEP STRENGTH IN CABOT ALLOY R-41 SHEET Final Report
Michael F. Rothman Aug. 1984 91 p refs
(Contract NAS1-15975)
(NASA-CR-172392; NAS 1.26:172392; Rept-11816) Avail: NTIS HC A05/MF A01 CSCL 11F

The feasibility of improving the low-strain creep properties of a thin gauge nickel base sheet alloy through modified heat treatment or through development of a preferred crystal-logaphic texture was investigated. The basic approach taken to improve the creep strength of the material by heat treatment was to increase grain size by raising the solution treatment temperature for the alloy to the range of 1420 K to 1475 K (2100 F to 2200 F). The key technical issue involved was maintenance of adequate tensile ductility following the solutioning of M6C primary carbides during the higher temperature solution treatment. The approach to improve creep properties by developing a sheet texture involved varying both annealing temperatures and the amount of prior cold work. Results identified a heat treatment for alloy R-14 sheet which yields a substantial creep-life advantage at temperatures above 1090 K (1500 F) when compared with material given the standard heat treatment. At the same time, this treatment provides reasonable tensile ductility over the entire temperature range of interest. The mechanical properties of the material given the new heat treatment are compared with those for material given the standard heat treatment. Attempts to improve creep strength by developing a sheet texture were unsuccessful. A.R.H.

N84-31347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FAILURE ANALYSIS OF PLASMA-SPRAYED THERMAL BARRIER COATINGS
Christopher C. Berndt (Cleveland State Univ.) and Robert A. Miller 1984 13 p refs Presented at the 11th Intern. Conf. on Met. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by American Vacuum Society
(NASA-TM-83777; E-2269; NAS 1.15:83777) Avail: NTIS HC A02/MF A01 CSCL 11F

Thermally induced failure processes of plasma-sprayed thermal barrier coatings are examined. Cracking processes give rise to noise which was monitored by acoustic emission (AE) techniques. The sequential failure of coatings was examined from samples which were thermally cycled. Coatings of yttria-stabilized zirconia with and without a NiCrAlZr bond coat were plasma-sprayed onto U700 alloy rod. In some cases the substrate was intentionally overheated during deposition of the thermal protection system to check how this process variable influenced the AE response of the specimen. In this way a qualitative appraisal of how process variables affect coating integrity could be discerned in terms of cracking behavior. Results from up to seven consecutive thermal cycles are reported here. Coating failure was observed in all cases. Failure of the thermal protection system is progressive, since cracking and crack growth were observed prior to ultimate failure. Thus castastrophic failure occurs at some stage when there is a transformation from the microcrack to a macrocrack network. Author

N84-31348*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF THE EFFECT OF CRACK CLOSURE ON FATIGUE CRACK GROWTH OF SIMULATED SHORT CRACKS
Jack Telesman and Douglas M. Fisher Aug. 1984 12 p refs
(NASA-TM-83778; E-2063; NAS 1.15:83778) Avail: NTIS HC A02/MF A01 CSCL 11F

A test program was performed to determine the influence of crack closure on fatigue crack growth (FCG) rates of short cracks. By use of the standard compact tension specimen, test procedures were devised to evaluate closure loads in the wake of the crack behind its tip. The first procedure determined the magnitude of crack closure as a function of the fatigued crack wave by incrementally removing the contacting wake surfaces and measuring closure load at each increment. The second procedure used a low-high loading sequence to simulate short crack behavior. Based on the results, it was concluded that crack closure is not the major reason for the more rapid growth of short cracks as compared to long crack growth. Author

N84-31349*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EMPIRICAL RELATIONS FOR CAVITATION AND LIQUID IMPINGEMENT EROSION PROCESSES
P. Veerabhadra Rao and Donald H. Buckley Aug. 1984 27 p refs Submitted for publication
(Contract NCC3-21)
(NASA-TP-2339; E-1872; NAS 1.60:2339) Avail: NTIS HC A03/MF A01 CSCL 11F

A unified power-law relationship between average erosion rate and cumulative erosion is presented. Extensive data analyses from venturi, magnetostriction (stationary and oscillating specimens), liquid drop, and jet impact devices appear to conform to this relation. A normalization technique using cavitation and liquid impingement erosion data is also presented to facilitate prediction. Attempts are made to understand the relationship between the coefficients in the power-law relationships and the material properties. Author

N84-31350*# Textron Bell Aerospace Co., Buffalo, N. Y. Electroforming Operations Dept.
STUDY OF HIGH PERFORMANCE ALLOY ELECTROFORMING Monthly Technical Progress Narrative, 30 Jul. - 24 Aug. 1984
G. A. Malone 6 Jun. 1984 6 p
(Contract NAS8-35817)
(NASA-CR-173865; NAS 1.26:173865; MTPN-8) Avail: NTIS HC A02/MF A01 CSCL 11F

Nickel-manganese alloy electrodeposits from an electrolyte containing more manganese ion than previously used is being evaluated at two bath operating temperatures with a great variety of pulse plating conditions. Saccharine was added as a stress reducing agent for the electroforming of several of the samples with highest manganese content. All specimens for mechanical property testing have been produced but are not through the various heat treatments as yet. One of the heat treatment will be at 343 C (650 F), the temperature at which the MCC outer electroformed nickel shell is stress relieved. A number of retainer specimens from prior work have been tested for hardness before and after heat treatment. There appears to be a fairly good correlation between hardness and mechanical properties. Comparison of representative mechanical properties with hardnesses are made for nickel-manganese electrodeposits and nickel-cobalt-manganese deposits. Author

N84-31351# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORGING AND STAMPING NONFERROUS METALS. HANDBOOK
N. I. Kornoyev, V. M. Arzhakov, B. G. Barmashenko, V. B. Yemelyanov, and V. Y. Kleymenov 10 May 1984 624 p Transl. into ENGLISH of mono. "Kovka i Shtampovka Tsvetnykh Metallov Spravochnik" Moscow, 1972 p 1-229
(AD-A141689; FTD-ID(RS)T-1735-83) Avail: NTIS HC A99/MF A01 CSCL 11/6

Information on the chemical composition, the physical and mechanical properties, the thermomechanical parameters, and the processes of forging and stamping nonferrous metals is given. Aluminum, magnesium and titanium are among the metals discussed. R.J.F.

N84-31352# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
POWDER METALLURGY OF LIGHT METAL ALLOYS FOR DEMANDING APPLICATIONS Final Report
F. H. Froes and J. R. Pickens Jan. 1984 18 p Repr. from J. of Metals, v. 36, no. 1, Jan. 1984 p 14-28
(AF Proj. 2418)
(AD-A142066; AFWAL-TR-84-4084) Avail: NTIS HC A02/MF A01 CSCL 11/6

There are several reasons for choosing the powder metallurgy (P/M) method of processing fine metal particles over the ingot metallurgy method. The main reasons are cost reduction and higher performance requirements. However, the reasons may vary with each application. Powder metallurgy circumvents the segregation associated with ingot metallurgy, where cooling from the molten state is slow, causing workability problems. Powder metallurgy greatly increased cooling rate results in extension of solid solubility limits, causing larger volume fractions of finer second phase particles. Also, powder metallurgy offers increased tolerance to tramp elements not available with the ingot metallurgy method. The powder metallurgy approach allows the addition of powders having different compositions at the loose powder stage resulting in mechanical properties which may be tailored at various locations. With aluminum, powder metallurgy has allowed the development of new alloy families. For titanium, powder metallurgy is used because of cost considerations. S.B.

N84-31353# Carnegie-Mellon Univ., Pittsburgh, Pa.
THE EFFECTS OF DEFORMATION MODE AND MICROSTRUCTURE FRACTURE-RELATED PROPERTIES OF TI ALLOYS Final Report, 1 Nov. 1979 - 30 Jun. 1983
J. E. Allison and J. C. Williams 28 May 1984 20 p
(Grant AF-AFOSR-0044-80)
(AD-A142891; JW-FR-2-AFOSR; AFOSR-84-0530TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

Fatigue crack growth has been studied in two binary Ti-Al alloys, an 8 wt.% Al and a 4 wt.% Al alloy. It has been found that the crack growth rate is faster than in the 4% Al alloy. The principal difference between the alloys is that the higher Al alloy exhibits planar slip. The effect of this planar slip character is to cause a more irregular crack path. This increase in crack path irregularity causes roughness-induced closure. Back face strain measurements have been used to measure the variation in closure and to calculate an effective delta K. It iso has been shown that the crack growth rates for the two alloys coincide if the variations in closure are taken into account. Elevated temperature crack growth experiments have also been conducted and oxide-induced closure effects have been found in this case. This type of closure also affects the crack growth rate. Finally, crack growth experiments at high mean stress have been conducted and it has been found that the closure effects disappear. The implications of this work on the selection of materials for fatigue crack growth limited applications is discussed. Author (GRA)

N84-31354# California Univ., Livermore. Lawrence Livermore Lab.
SIMULATIONS OF EROSION/CORROSION SURFACE CHEMICAL REACTIONS WITH A LASER BEAM
C. W. Price 1 Nov. 1983 110 p Sponsored in part by Army Research Office
(Contracts MIPR-26-78; MIPR-27-80; W-7405-eng-48)
(AD-A143001; DE84-011621; UCRL-53468; ARO-15812.7-MS) Avail: NTIS HC A06/MF A01 CSCL 07/4

Surface chemical reactions in highly transient reactive environments frequently contribute to material degradation and subsequent loss by erosion/corrosion mechanisms. An attempt was made to simulate these reactions with a pulsed laser system in a pressure chamber. Gaseous carburizing and nitriding reactions were studied because of their frequent occurrence in erosion/corrosion environments. Reactions in pure iron and AISI 4340 steel were characterized by secondary ion mass spectroscopy (SIMS), optical metallography, and scanning electron microscopy (SEM). Gases used for laser-pulsing included argon, methane, carbon monoxide, ammonia, and nitrogen. The effect of gas pressure also was investigated. The results demonstrate that significant amounts of the reactive species can be driven into metal surfaces if the energy of the laser pulse exceeds the threshold for surface melting to occur. Test also were performed on steel specimens coated with tungsten to demonstrate the capability of the laser system to test candidate coating materials. GRA

N84-31355# California Univ., Livermore. Lawrence Livermore Lab.
FUNDAMENTAL MECHANISMS OF MULTI-PHASE FLOW EROSION/CORROSION OF SOLID SURFACES Final Report, 1 Sep. 1978 - 30 Jun. 1983
A. C. Buckingham and C. W. Price Jun. 1984 12 p
(Contracts MIPR-26-78; MIPR-27-80; MIPR-8-81; MIPR-5-82)
(AD-A143041; ARO-15812.8-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

Gun tubes, rocket and gas turbine nozzles, exit cones, thrust diverters, launchers as well as electric, plasma and electromagnetic thrust device solid walls suffer erosion/corrosion and general deterioration from their working environment. This research emphasized identification and understanding of the dominant fundamental mechanisms leading to surface deterioration. It was also directed to study the materials, material properties, material dynamics and material preparation effective for resisting this deterioration. Author (GRA)

N84-31356# Naval Postgraduate School, Monterey, Calif.
SUPERPLASTICITY IN THERMOMECHANICALLY PROCESSED HIGH MAGNESIUM ALUMINUM-MAGNESIUM ALLOYS M.S. Thesis
J. J. Becker Mar. 1984 102 p

(AD-A143164) Avail: NTIS HC A06/MF A01 CSCL 11/6

The elevated temperature deformation characteristics of two thermomechanically processed high magnesium, aluminum-magnesium alloys were investigated. The thermomechanical processing itself included warm rolling at 300 deg C to 94% reduction. Subsequent treatments included annealing after rolling for either one-half hour or ten hours at 300 deg C, or one half hour at 440 deg C. These annealing treatments resulted in varying degrees of recrystallization and grain growth and facilitated examination of the effect of grain size on the superplastic deformation characteristics of these alloys. Tension testing was conducted at strain rates ranging from .000053 to .053 S-1 and temperatures varying from ambient to 300 deg C. Materials in the warm rolled condition exhibited the highest strength at ambient temperature and were generally most superplastic at elevated temperature. An Al 10% Mg-0.5% Mn alloy exhibited elongation of approximately 400% at 300 deg C. GRA

N84-31357# Houston Univ., Tex. Dept. of Physics.

MICROSTRUCTURAL STUDIES OF HYDROGEN AND DEUTERIUM IN BCC REFRACTORY METALS Final Technical Report

Simon C. Moss Apr. 1984 13 p

(Contract DE-AS05-76ER-05111)

(DE84-011506; DOE/ER-05111/T1) Avail: NTIS HC A02/MF A01

Research was conducted on the microstructural atomic arrangements in alloys of hydrogen and deuterium with bcc refractory metals with emphasis on V and Nb. Because these are interstitial phases in which the host metal lattice is substantially deformed by the incorporation of the H(D) atoms, there are pronounced X-ray scattering effects. X-ray diffraction was used, with neutron scattering providing useful corollary data. One objective was to determine the phase relations, solid solution structures and phase transitions in metal hydride alloys which depend upon the hydrogen-hydrogen interaction via the displacement field of the metal atoms. This often included the elucidation of subtle thermodynamic properties (as in critical wetting) which are revealed in structural studies. Crystals were supplied for positron annihilation studies of the Fermi surface of H-Ta alloys which revealed significant electronic trends. Work on alkali graphite intercalates was initiated. DOE

N84-31358# California Univ., Livermore. Lawrence Livermore Lab. Materials Fabrication Div.

METAL FINISHING AND VACUUM PROCESSES GROUPS Progress Report, Nov. 1983 - Feb. 1984

J. G. Romo and J. W. Dini 27 Mar. 1984 13 p

(Contract W-7405-eng-48)

(DE84-011046; UCID-19605-84-1) Avail: NTIS HC A02/MF A01

Fabrication developments and activities are reported in support of the following programs: weapons; nuclear tests; nuclear design; magnetic fusion; lasers; and miscellaneous. DOE

N84-31359# Massachusetts Inst. of Tech., Cambridge. Nuclear Reactor Lab.

ION BOMBARDMENT EFFECTS OF THE FATIGUE LIFE OF STAINLESS STEEL UNDER SIMULATED FUSION FIRST WALL CONDITIONS

G. Kohse and O. K. Harling 1984 5 p refs Presented at the 3rd Topical Meeting on Fusion Reactor Mater., Albuquerque, N. Mex., 19 Sep. 1983

(Contract DE-AC02-78ET-52027)

(DE84-001300; CONF-830942-48) Avail: NTIS HC A02/MF A01

Pressurized tube specimens have been exposed to simultaneous multi-energy surface ion bombardment, fast neutron irradiation and stress and temperature cycling, in a simulation of a possible fusion reactor first wall environment. After ion bomdardments equivalent to months-years to reactor operation and up to 30,000 cycles, no detrimental effects on post-irradiation fatigue life were found. The ion damage is found to enhance surface cracking, but this effect is limited to the several micron surface layer in which the ions are implanted. DOE

N84-31360# Cornell Univ., Ithaca, N.Y. Dept. of Materials Sciences and Engineering.

ENVIRONMENT AND FRACTURE Final Report

Herbert H. Johnson 1984 45 p

(Contract DE-AC02-76ER-03166)

(DE84-011454; DOE/ER-03166/34; COO-3166-34) Avail: NTIS HC A03/MF A01

A study of hydrogen transport through the glassy metal alloy Fe40Ni40P16B4 is reported. A thin layer of electrodeposited palladium eliminated surface impedances to hydrogen entry and exit. Sievert's law behavior was observed over the pressure (to the 3rd power to 10 to the 5th power PA) and temperature (313 to 353K) ranges studied. An excellent fit to permeation transients was obtained from numerical solution of Fick's diffusion equation without trapping. Diffusivities derived from least squares fitting of transients were in good agreement with those obtained from time lag measurements. The results were not influenced by trapping, as within the concentration range studied, diffusivities were not influenced by concentration. Permeating measurements on stressed iron membranes established that the phenomenological partial atomic volumes of hydrogen and deuterium are equal. DOE

N84-31361# Illinois Univ., Urbana.

RAPID SOLIDIFICATION AND UNDERCOOLING OF ALUMINUM GERMANIUM ALLOYS: CHARACTERIZATION AND CONTROL OF MICROSTRUCTURE Ph.D. Thesis

Michael Joseph Kaufman 1984 197 p refs

(Contract DE-AC02-76ER-01198)

(DE84-012395; DOE/ER-01198/1409) Avail: NTIS HC A09/MF A01

In addition to the in-situ solidification and undercooling studies, melt spun ribbons, splat quenched foils and amorphous films of similar compositions were analyzed. The as-produced microstructures were characterized in the microscope and, subsequently, the amorphous films were heated with the beam to cause crystallization, the products of which were found to vary with composition and heating rate. A computer model was developed in an effort to predict the number of grains which form in highly undercooled Al-30Ge (eutectic) droplets. This model utilizes modified nucleation and growth equations for glass forming alloys to predict the number of alpha Al grains which form upon solidification. It is shown that the number of grains increases significantly as the initial undercooling is raised. However, as the undercooling temperatures approach the glass transition temporature, the number of grains is predicted to drop suddenly toward zero resulting in the formation of amorphous (or partially amorphous) microstructures. These predictions are in good agreement with the experimental observations. DOE

N84-31362# Oak Ridge National Lab., Tenn.

PERSPECTIVE OF THE CORROSIVE BEHAVIOR OF LITHIUM AND SODIUM

J. H. DeVan and C. Bagnall (Westinghouse Electric Corp., Pittsburgh) 19 Apr. 1984 8 p refs Presented at 3rd Meeting on Liquid Metal in Energy Appl., Oxford, 9 Apr. 1984

(Contract DE-AC05-84OR-21400)

(DE84-011635; CONF-840411-20) Avail: NTIS HC A02/MF A01

Although the corrosion properties of sodium were studied extensively between 500 and 650 C, the corrosion information available for lithium at these temperatures is still fragmentary, and the understanding of corrosion processes is far behind that for sodium. A review of the available corrosion data shows striking similarities in the overall mass transfer processes for lithium and sodium in austenitic stainless steel systems. Preferential depletion of nickel and chromium leads to the development of a ferrite surface layer and a constant corrosion rate with time. However, the corrosion processes also show basic differences in terms of the microscopic appearance of the ferrite surface layer and the effects of oxygen and nitrogen impurites. These similarities and differences are reviewed in the context of corrosion mechanisms and kinetics that operate under dynamic flow conditions. DOE

N84-31363# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
BEHAVIOR OF Ni-Cr-Si COATING ALLOYS IN Na_2SO_4, V_2O_5 AND MIXED SALT HOT CORROSION Final Report
R. G. Corey, A. S. Khan, R. H. Barkalow, and R. J. Hecht 1 Oct. 1983 52 p refs
(Contract DE-AC06-79ET-15322)
(DE84-012386; DOE/ET-15322/T6; FR-15738) Avail: NTIS HC A04/MF A01

This report describes the results of a program to select coating alloys that are resistant to vanadium- and sulfate-induced hot corrosion and solid particle erosion in the 700 to 900 C temperature range. Test materials, methods, and results are discussed. The principal alloy coatings that were tested were high-chromium, nickel-base alloys with additions of silicon, aluminum, and tantalum. DOE

N84-31364# Sandia Labs., Albuquerque, N. Mex.
SODIUM COMPATIBILITY OF REFRACTORY METAL ALLOY/304L BRAZE JOINTS
F. M. Hoeking May 1984 47 p refs
(Contract DE-AC04-76DP-00789)
(DE84-012877; SAND-84-0708) Avail: NTIS HC A03/MF A01

Vacuum induction brazing of Mo, Re, Ta, and W alloys to 304L stainless steel and metallic glass (MNi-3 and modified BNi-5) brazing alloys were evaluated. There was no significant chemical corrosive attack observed on any of the sodium samples and weight changes were generally negligible. Braze separation along the refractory metal interface and crack growth in the filler metal, however, were observed in the metal powder brazes after the sodium exposures. The metal powder fillers are not recommended. A band of discontinuous voids in the metallic glass brazes near the refractory metal interface was also detected. Metallographic, thermal and microprobe analyses revealed that these voids were caused by a diffusion mechanism called Kirkendall porosity. The voids are not connected and will not provide a leak path and the metallic glass filler metals are recommended for brazing refractory metal alloys to 304L and for subsequent sodium exposures. DOE

N84-31365# Connecticut Univ., Storrs.
INVESTIGATION OF ROLE OF SUBSURFACE ZONES IN WEAR OF MATERIALS Progress Report, 1 Jun. 1983 - 31 May 1984
R. Solecki, H. Nowotny, and S. L. Rice May 1984 4 p refs
(Contract DE-AC02-81ER-10910)
(DE84-012752; DOE/ER-10910/03) Avail: NTIS HC A02/MF A01

This report presents experimental and theoretical results from investigations conducted on the role of subsurface zones in wear of materials. Wear tests in both sliding and compounds impact modes have been carried out on a variety of metallic materials. Significant experimental results include findings from stiffness, material pair reversal, hardness reversal test series and geometry contact studies. DOE

N84-31366# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
FIELD ION MICROSCOPY AND SPECTROSCOPY OF HYDROGEN IN METALS Progress Report, 1 Aug. 1983 - 1 Mar. 1984
1984 15 p
(Contract DE-AS05-83FR-45039)
(DE84-012972; DOE/ER-45039/1) Avail: NTIS HC A02/MF A01

Progress is reported on the double-tilt holer for TEM, new sample holder improved cryogenics for FIM, ion source for ion implantation, transient waveform digitizer, other computer interfacing, and preliminary calibration experiments. DOE

N84-31367# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
ANODIC PROCESSES AND THE KINETICS OF STRESS-CORROSION CRACKING OR CORROSION FATIGUE
R. C. Newman (Corrosion and Protection Center, UMIST, Manchester, England) 1983 14 p refs
(Contract DE-AC02-76CH-00016)
(DE84-012911; BNL-34778; CONF-8310205-10) Avail: NTIS HC A02/MF A01

Transient electrochemical measurements on film free metal surfaces which are used to test models of environment assisted crack growth are reviewed. The results about mechanisms of stress corrosion cracking and corrosion fatigue are assessed. DOE

N84-31368# Tennessee Univ., Knoxville. Dept. of Chemical, Metallurgical and Polymer Engineering.
A COMBINED THERMODYNAMIC STUDY OF NICKEL-BASE ALLOYS Final Report
Charlie R. Brooks Aug. 1983 39 p
(Contract DE-AS05-78ER-05951)
(DE84-013467; DOE/ER-05951/4) Avail: NTIS HC A03/MF A01

A method of making a high temperature, solid electrolyte was developed, and was successful in emf measurements on some Ni-Mo and Ni-Mo-Cr alloys. The heat capacity of Ni4Mo from 3000 to 1100(0)K was measured and the construction and testing of a low temperature calorimeter was completed. A computer program to calculate binary phase diagrams from thermodynamic data is written and utilized in analyzing some systems. DOE

N84-31369# Argonne National Lab., Ill.
HARD COATINGS FOR TRIBOLOGICAL SYSTEMS OPERATING UNDER EXTREME CONDITIONS
Mar. 1984 183 p refs Proc. of workshop held in Argonne, Ill., 8-9 Sep. 1983; sponsored by DOE and Energy Conservation Program
(Contract W-31-109-eng-38)
(DE84-009660; CONF-8309212) Avail: NTIS HC A09/MF A01

This workshop addressed a critical issue connected with the operation of equipment in certain high technology applications in which components have contacting surfaces in relative motion under extreme operating conditions (e.g., high temperature, high load, high speed, high vacuum), and show excessive wear rates and/or frictional energy losses. It was the overall objective of the workshop to identify key research and development areas for hard coatings to be used in tribology systems operating under such extreme conditions. Separate abstracts were prepared for individual papers. DOE

N84-31370# Schwelmer Eisenwerk Mueller und Co. G.m.b.H., Schwelm (West Germany).
INVESTIGATIONS OF MECHANICAL PROPERTIES OF HIGH STRENGTH STEELS AND THEIR SUITABILITY FOR GLASS LINING Final Report, Mar. 1983
Gerhard Kunze and Klaus Patzke Bonn Bundesministerium fuer Forschung und Technologie May 1984 193 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-076; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

High strength steels were tested for use in manufacturing glass lined vessels for the chemical industry. Satisfactory technological properties after the heat treatment during the glass lining process are required. Filler metals with properties comparable to those of the base material were also tested. Ground enamels were developed to achieve an improved bond on the high strength steels and more favorable mechanical properties of the glass. The tests of base materials and welded joints, subjected to simulated heat treatment cycles applied during curing of the glass, enabled suitable base materials and filler metals to be found. The glassing of these materials and the required mechanical properties of the enamel were verified. Author (ESA)

N84-31371# Centre Technique des Industries Mecaniques, Senlis (France).
DEPOSITS ON LIGHT ALLOYS Final Report [DEPOTS SUR ALLIAGES LEGERS]
B. Sutter and M. A. Laroche Feb. 1983 35 p refs In FRENCH
(CETIM-12-F-380) Avail: NTIS HC A03/MF A01

Aluminum surface treatment processes were reviewed. For

mechanical uses, nickel coating by chemical means is recommended. Adhesion is satisfactory and can be improved by heat treatment. It has good corrosion and wear resistance. The low deposition rate and high temperature bath are drawbacks compared with electrolytic coatings, but it can be used with any aluminum alloy and does not require rinsing. Author (ESA)

N84-31372# Centre Technique des Industries Mecaniques, Senlis (France).
PULSED CURRENT HARD CHROMIUM PLATING Final Report [CHROMAGE DUR EN COURANT PULSE]
B. Sutter, Vasseur, and J. Reby Mar. 1984 19 p In FRENCH
(CETIM-12-F-390) Avail: NTIS HC A02/MF A01

An electrolytic current with periodic inversions was used to obtain crack free chromium plating from a standard plating bath. Deposition rate is almost identical to continuous current techniques. Deposit hardness is slightly lower, but is sufficient for most mechanical applications. Proper surface preparation enables much better corrosion resistance to be achieved than with the usual chrome coatings. Author (ESA)

N84-31373# Centre Technique des Industries Mecaniques, Senlis (France).
HYDROGEN FATIGUE TEST Final Report [TEST DE FRAGILISATION PAR L'HYDROGENE]
J. P. Boisrame, J. Reby, and B. Sutter Jan. 1984 17 p refs In FRENCH
(CETIM-12-F-400) Avail: NTIS HC A02/MF A01

A test to ensure that degassing procedures on high strength steels following electrodeposition are carried out correctly was devised. Test pieces are placed in silicon oil and heated to 200 C. Escaping hydrogen is trapped in a column above the oil. Zinc coated screws were tested. Results are fairly random and the method is not recommended. Author (ESA)

N84-31374# Centre Technique des Industries Mecaniques, Senlis (France).
GASEOUS CEMENTATION IN NITROGEN-METHANOL ATMOSPHERES Final Report [CEMENTATION GAZEUSE EN ATMOSPHERE AZOTE-METHANOL]
Dominique Ghiglione Jan. 1984 92 p refs In FRENCH
(CETIM-12-G-284) Avail: NTIS HC A05/MF A01

Control of nitrogen-methanol atmospheres for heat and thermochemical treatments of metal was studied. Carbon potential curves obtained in a furnace were compared with theoretical predictions. Results show that a 40/60 nitrogen-methanol atmosphere can be checked using several gases; and using CO2 and water vapor content. Methane must not be used. Author (ESA)

N84-31375# Centre Technique des Industries Mecaniques, Nantes (France).
INFLUENCE OF COPPER ON MAG DEPOSITS Final Report [INFLUENCE DU CUIVRE SUR LES DEPOTS MAG]
Debiez (Inst. de Soudure) 19 Mar. 1984 50 p In FRENCH
(CETIM-12-Y-431) Avail: NTIS HC A03/MF A01

The influence of the copper content of MAG welding deposits using copper wire on weld properties and mechanical behavior was studied. Hardening, tensile, aging resistance and crack resistance tests were carried out on samples with varying copper content. Results show that no harmful effects are likely from copper wire used for welding. Author (ESA)

N84-31376# Centre d'Essais Aeronautique Toulouse (France). Laboratoire d'Etudes de Materiaux Metalliques.
CHARACTERIZATION OF COMMON STEELS. REPORT OF PARTIAL TEST NUMBER M6-645900, NUMBER 4 [CARACTERISATION D'ACIERS COURANTS. ALLIAGE; 35CD4. DEMI-PRODUIT: BARRE LAMINEE DIAMETRE DE 30MM. ELABORATEUR: CREUSOT-LOIRE. PROCES-VERBAL DE L'ESSAI NO. M6 645900, PARTIEL NO. 4]
18 Apr. 1984 65 p In FRENCH
Avail: NTIS HC A04/MF A01

Tensile, impact strength, rupture, toughness, crack propagation, and axial fatigue tests were performed on high strength steel 35CD4. Tensile strength : R = 1313 MPa; RO = 1249 MPa; A = 13%. Impact strength : KCV = 42J/sqcm; ENC = 32J; ECO = 22J; transition temperature = 0C. Toughness : KQ = 89 MPA sq root m. Crack propagation : da/dN = 0.000015 mm/cycle for delta K = 10 MPa sq root m; and 0.001 mm/cycle for delta K = 60 MPa sq root m. Author (ESA)

N84-31377# United Nations Industrial Development Organization, Vienna (Austria).
ADVANCE IN MATERIALS TECHNOLOGY: MONITOR ISSUE NUMBER 1
1984 64 p refs
(PB84-196286; V-83-64212) Avail: NTIS HC A04/MF A01 CSCL 11F

Information is given on new materials, with special reference to high strength low alloys steel. Advances in materials and related technological changes and their implications for developing countries; manufacturing alloy steels (based on experience in USA; new materials, products and processes in the field of alloy steel production; information sources; cooperation; technology transfer; research; testing and the role of the United Nations Industrial Development Organization inn promotion of iron and steel industry are discussed. GRA

N84-31439# Joint Publications Research Service, Arlington, Va.
EFFECT OF ION TREATMENT OF SUBSTRATES ON INITIAL STAGE OF BUILDUP OF METAL FILMS Abstract only
A. V. Stepuro, T. S. Turovskaya, G. A. Muranova, and A. F. Perveyez *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 22 Transl. into ENGLISH from Optiko-Mekhan. Promyshlennost (Leningrad), no. 11, Nov. 1983 p 30-34 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-31378*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIELECTRIC CURE MONITORING: PRELIMINARY STUDIES
Benjamin E. Goldberg and Marie Louise Semmel May 1984 38 p refs
(NASA-TM-86452; NAS 1.15:86452) Avail: NTIS HC A03/MF A01 CSCL 11B

Preliminary studies have been conducted on two types of dielectric cure monitoring systems employing both epoxy resins and phenolic composites. An Audrey System was used for 23 cure monitoring runs with very limited success. Nine complete cure monitoring runs have been investigated using a Micromet System. Two additional measurements were performed to investigate the Micromet's sensitivity to water absorption in a post-cure carbon-phenolic material. While further work is needed to determine data significance, the Micromet system appears to show promise as a feedback control device during processing. B.W.

N84-31379*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADHESION BETWEEN POLYMERS AND EVAPORATED GOLD AND NICKEL FILMS
Yoshinori Yamada, Donald R. Wheeler, and Donald H. Buckley Aug. 1984 11 p refs
(NASA-TP-2360; E-2018; NAS 1.60:2360) Avail: NTIS HC A02/MF A01 CSCL 11B

To obtain information on the adhesion between metal films and polymeric solids, the adhesion force was measured by means of a tensile pull test. It was found that the adhesion strengths between polymeric solids and gold films evaporated on polymer

substrates were (1.11 + or - 0.53) multiplied by 10(6) N/M(2) on PTFE, about 5.49 multiplied by 10(6) N/m(2) on UHMWPE, and 6.54x10(6) on 6/6 nylon. The adhesion strengths for nickel films evaporated on PTFE, UHMWPE, and 6/6 nylon were found to be a factor of 1.7 higher than those for the gold coated PTFE, UHMWPE, and 6/6 nylon. To confirm quantitatively the effect of electron irradiation on the adhesion strength between a PTFE solid and metal films, a tensile pull test was performed on the irradiated PTFE specimens, which were prepared by evaporating nickel or gold on PTFE surfaces irradiated by 2-keV electrons for various times. After irradiation, the adhesion strength increased to (4.92 + or - 0.92)x10(6) N/m(2) for nickel coated PTFE and (1.82 + or - 0.48)x10(6) N/m(2) for gold coated PTFE. The improvement in adhesion for nickel is higher than that for gold.
Author

N84-31380# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
COMPUTER-AIDED ENGINEERING (CAE) IN PLASTICS TECHNOLOGY
H. Bangert 1983 31 p refs Transl. into ENGLISH from Kunststoffe (West Germany), no. 10, 1982 p 661-670
(CSIR-Trans-1725) Avail: NTIS HC A03/MF A01

An explanation is given of the terms computer aided design, computer aided engineering, computer aided manufacturing and computer aided planning. Possible new development in the various fields of plastics technology based on the use of computers are discussed. A short description of the capability of the systems is followed by a discussion of the operational and technical conditions required to ensure that good use is made of the computer. The particular mode of operation and the advantages to be obtained through computerization - particularly computer aided engineering - are explained by means of practical examples of applications. Examples relating to the rheological, thermal and mechanical design of moulded parts and tools are presented and complemented by a discussion of the use of the computer in solving economic problems. Some of the practical problems arising from the introduction of computers are reviewed. R.J.F.

N84-31381# Army Inst. of Dental Research, Washington, D. C.
THE WETTING OF CERAMIC OPAQUE SUSPENSIONS ON OXIDIZED ALLOY SURFACES
G. D. Woolsey, L. Lorton, and W. J. OBrien 10 Jun. 1984 22 p
(AD-A142899) Avail: NTIS HC A02/MF A01 CSCL 06/5

Liquid mediums used with opaque porcelain powders are crucial in the application of opaque slurries to oxidized metal surfaces. To augment the effective application of opaque porcelain, liquid mediums should wet oxidized metal surfaces well (indicated by a low contact angle). The liquid-metal-surface interaction is a critical factor in the wetting of alloys by liquid suspensions. A multifactorial treatment design was used to evaluate the effects of various metals, liquids, surface preparation, and possible interactions on wetting. Five opaque liquid mediums were evaluated photographically by sessile drop contact angle measurements on five oxidized metal surfaces. GRA

N84-31382# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
TRANSPORT BEHAVIOR OF MULTIVALENT BETA ALUMINAS
B. Dunn and G. Farrington May 1984 11 p
(Contracts N00014-83-K-0498; N00014-81-K-0526; Grant NSF DMR-79-23647)
(AD-A142968; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

Ion exchange reactions were used to substitute divalent and trivalent cations for the entire sodium ion content of sodium beta alumina. A wide range of divalent and trivalent beta aluminas were synthesized which exhibited conductivities much greater than any other divalent or trivalent solid electrolyte in the 300-400 deg C range. The multivalent beta aluminas greatly extend the opportunities for electrochemical sensors based on solid electrolytes. Author (GRA)

N84-31383# Case Western Reserve Univ., Cleveland, Ohio.
STATISTICAL-MECHANICAL STUDY OF POLYVINYLIDENE FLUORIDE Final Report, Jul. 1980 - Jun. 1984
P. L. Taylor 1 Jun. 1984 9 p
(Contract DAAG29-80-K-0047)
(AD-A143040; ARO-17224.6-PH) Avail: NTIS HC A02/MF A01 CSCL 11/9

A final report is presented of work performed in the study of the properties of polyvinylidene fluoride by the theoretical techniques of statistical mechanics and condensed-matter theory. The nature of piezoelectricity and pyroelectricity in polymers and their dependence on crystal structure and internal electric fields has been thoroughly investigated. The time-dependence and microscopic origin of the poling process has been studied and accounted for. GRA

N84-31384# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
EFFECT OF POLYDISPERSITY ON THE CLOUD POINT CURVES OF POLYMER MIXTURES
R. J. Roe and L. Lu 15 Jun. 1984 22 p Submitted for publication
(Contract N00014-77-C-0376; NR Proj. 356655)
(AD-A143159) Avail: NTIS HC A02/MF A01 CSCL 07/3

A method is presented for the calculation of cloud point curves of polymer-polymer mixtures when the polymers involved are polydisperse. The method is based on the Flory-Huggins free energy of mixing with a concentration-independent chi parameter. Numerical results are given for the cases where the molecular weight distributions are represented by the Schulz-Flory type. When the two polymers have similar average molecular weights and polydispersities, the cloud point curves become flatter as the polydispersity increases. When the two polymers have similar average molecular weights but differ in their polydispersities, the cloud point curves become more skewed as the difference in the polydispersity increases. The results point out that, if the polydispersity effect is not properly accounted for, the value of chi deduced from experimental cloud points is liable to be in error, especially with regard to its temperature coefficient or its concentration dependence. Author (GRA)

N84-31385# Solar Thermal Test Facilities, Albuquerque, N. Mex.
CERAMIC HEAT EXCHANGER DESIGN METHODOLOGY Final Report
K. O. Smith Jan. 1984 74 p refs
(Contract W-31-109-eng-38)
(DE84-010581; ANL/FE-84-6) Avail: NTIS HC A04/MF A01

The methodology employed in designing a high pressure, ceramic heat exchanger test module is described. The unit was designed and fabricated to demonstrate and advance the use of structural ceramics in a typical industrial heat exchanger configuration. The specific configuration adopted is an axial-counterflow unit with ceramic tube heat exhanger elements and a ceramic exhaust header at the high temperature end of the module. Such a unit has potential for use in coal gasification, indirectly-fired gas turbine, and industrial heat recovery applications. The design methodology description includes the procedures and analytical relations associated with the thermal, fluid mechanical, and structural aspects of ceramic heat exchanger definition. DOE

N84-31386# Kanner (Leo) Associates, Redwood City, Calif.
PROPERTIES OF POLYMERS: SOME USES IN ELECTRONICS, PART 1
Marc Carrega 1984 16 p Transl. into ENGLISH from Colloq. Intern. sur les Nouvelles Orientations des Composants Passifs: Materiaux, Tech., Mise en Oeuvre (Paris), 1983 p 49-54 Prepared for Los Alamos Scientific Lab., N. Mex.
(Contract W-7405-eng-36)
(DE84-012863; LA-tr-84-14-Pt-1) Avail: NTIS HC A02/MF A01

Thermomechanical behavior of polymers is discussed. Glass transition, rubbery behavior, and melting of semi crystalline polymers are also investigated. Relationships between the chemical structure and the thermomechanical behavior is explored. The case

of polypropylene is considered. Processing and thermal posttreatment effects, as well as dimensional stability are discussed. Impact resistance and permeability are also studied. DOE

N84-31387# Los Alamos Scientific Lab., N. Mex.
PROPERTIES OF POLYMERS: SOME USES IN ELECTRONICS, PART TWO
1984 21 p refs Transl. into ENGLISH from Colloq. Intern. sur les Nourvelles Orientations des Composants Passifs: Materiaux, Technol., Mise en Oeuvre, Communications Press p 55-62 Colloq. presented at Paris, 1983
(DE84-012864; LA-tr-84-15-Pt-2) Avail: NTIS HC A02/MF A01

The dielectrical properties of polymers are considered. Some prospective applications to capacitors are proposed, and conductive and semiconductive polymers are described. The use of plastic materials is developed to a high degree in electronics and electrical engineering for applications such as capacitors, cable wrapping, coating for components, and various supports. Other less standard applications appear in the realm of optical communications, information storage, and the manufacture of new components. In these applications, the molecular structure and morphology play a significant role. This structure-property relationship is discussed in the following realms along with some examples: dielectrics - new materials and applications to capacitors, semiconductors and conductors, intrinsic conductors (polyacetylene and polyphenylene), and charged polymer conductors. DOE

N84-31388# Optical Coating Lab., Inc., Santa Rosa, Calif.
RECENT DAMAGE RESULTS FOR ANTIREFLECTION COATINGS AT 355 NM
Tuttle T. Hart, C. K. Carniglia, R. Rainer (California Univ., Lawrence Livermore Lab.), and M. C. Staggs (California Univ., Lawrence Livermore Lab.) Livermore, Calif. California Univ., Lawrence Livermore Lab. 1 Mar. 1984 8 p refs Presented at the Damage Symp., Boulder, Colo., 14-16 Nov. 1983
(Contract W-7405-eng-48)
(DE84-011560; UCRL-89872; CONF-011560) Avail: NTIS HC A02/MF A01

High index and low index thin film antireflection (AR) coatings for use at 355 nm were tested to determine their resistance to laser damage. All coatings consisted of dielectric materials which were vacuum deposited onto bowl feed polished Suprasil II by evaporation. Laser damage studies were made by irradiating several sites on each sample with a 0.6 ns, 355 nm laser pulse. Each site was irradiated by only one pulse. All coatings had four nonquarterwave thick layers plus a halfwave thick undercoat (barrier layer) of the low index material made from scandia/magnesium fluoride had the highest damage thresholds. Low index coatings contained only low index materials. The AR coatings which contain three to six quarterwave thick layers plus a halfwave thick barrier layers were made from nine combinations of these six materials. Coatings made from samarium fluoride/magnesium fluoride have the highest damage thresholds. One set of four scandia/silica coatings is measured at both 355 nm and 248 nm. Damage thresholds at 248 nm for these parts are determined using 20 ns laser pulses. DOE

N84-31389# Pacific Northwest Lab., Richland, Wash.
ANALYTICAL CHARACTERIZATION OF COATINGS AND THIN OVERLAYERS
S. D. Dahlgren, M. T. Thomas, R. H. Beauchamp, and E. L. Courtright Mar. 1984 23 p refs Presented at Intern. Conf. on Metallurg. Coatings, San Diego, Calif., 9 Apr. 1984
(Contract DE-AC06-76RL-01830)
(DE84-011902; PNL-SA-11881; CONF-840135-2) Avail: NTIS HC A02/MF A01

Recent coating characterization projects were selected as examples for demonstration of several modern coating characterization methods. X-ray Photoelectron Spectroscopy (XPS) revealed differences in chemistry and atomic bonding in two commercial TiN sputter deposits. Second, an enhanced laser Raman method of phase identification for Si3N4 was used to provide detail in thin film deposits not possible by X-ray diffraction methods. Third, internal stresses and microstructure obtained by transmission electron microscopy (TEM) of sputter deposited ZrO2-8 mole % Y2O3 films were related to the parameters used during deposition. Lastly, an optical transmission method is shown to improve the resolution of a SiO2 glass phase that had formed on sintered silicon carbide coatings during high temperature oxidation. DOE

N84-31390# California Univ., Livermore. Lawrence Livermore Lab.
ENGINEERING PROPERTIES OF SOME COATINGS
J. W. Dini, W. C. Cowden and W. K. Kelley 18 Oct. 1983 14 p refs Presented at the Am. Electroplaters' Soc. SUR/FIN Conf., New York, 1 Jul. 1984
(Contract W-7405-eng-48)
(DE84-002715; UCRL-89933; CONF-840711-1) Avail: NTIS HC A02/MF A01

The contributions of H. J. Wiesner in advancing the state-of-the-art of electroplating are reviewed. Topics cover heavy rhodium plating; solutions for producing thick (0.5 mm to 1.5 mm) deposits of gold copper alloys, the anodizing of aluminum, quality control in electroforming, and lead tin alloys. DOE

N84-31391# Denver Research Inst., Colo.
INVESTIGATION OF SHOCK ACTIVATED SINTERING AND SHOCK WAVE CONSOLIDATION OF SELECTED POWDER MATERIALS Final Report
J. D. Mote and J. J. Fitzpatrick Feb. 1984 49 p refs
(Contract W-7405-eng-48)
(DE84-013074; UCRL-15603) Avail: NTIS HC A03/MF A01

The shock activation of titanium carbide, titanium diboride, aluminum nitride and aluminum oxide powders was investigated using the cylindrical geometry. A series of shock activation experiments was conducted in which the starting temperature of the material was the major variable. The effect of temperature on the defect structure created when the sample was subsequently shocked was investigated. Emphasis was then shifted to the direct consolidation of the selected powders. Again the cylindrical configuration was chosen and the initial temperature was the major variable. In both cases, the shock wave was created by detonating a uniform layer of powdered explosive which surrounded the sample container. The explosive layer is simultaneously initiated around the periphery of the cylinder at one end. The circumferential shock front thus progressed axially along the sample container wall. DOE

N84-31392# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
EFFECT OF CRYSTALLIZATION OF GRAIN BOUNDARY PHASE ON THE HIGH TEMPERATURE STRENGTH OF SILICON NITRIDE CERAMICS Final Report, 1 Apr. 1980 - 31 Mar. 1984
T. Y. Tien 1984 99 p refs
(Contract DE-AC02-80ER-10619)
(DE84-011786; DOE/ER-10619/T1) Avail: NTIS HC A05/MF A01

Grain growth kinetics of SIALON grains during hot pressing were studied. The decrease of K/sub IC/ value with the increasing amount of YAG in the annealed specimens in the system SIALON-YAG is attributed to the higher thermal expansion coefficient of the YAG than that of the SIALON crystals. The YAG crystals at the grain boundaries which crystallized at high temperatures during annealing contracted more than the SIALON grains during cooling and tension were generated at the interfaces. Cordierite has a lower thermal expansion coefficient than that of the SIALON crystals. The system SIALON-cordierite was then studied. The toughness of the ceramics in the system SIALON-cordierite increases upon annealing treatments. The glass formation and crystallization behavior in this system were studied. The results are reported: the microchemical analysis of the grain and grain boundary phases in the system SIALON-YAG; grain growth kinetics of (BETA) grains in the system SIALON-YAG; high temperature mechanical property measurements; the system SIALON-cordierite; and glass formation in the system SIALON-cordierite. DOE

N84-31393# California Univ., Livermore. Lawrence Livermore Lab.
VISCOELASTIC AND AGING CHARACTERISTICS OF POLYMERS
William W. Feng Apr. 1984 13 p refs Presented at the 8th Inter-Am. Conf. on Mater. Technol., San Juan, Puerto Rico, 25-29 Jun. 1984
(Contract W-7405-eng-48)
(DE84-012689; UCRL-90657; CONF-8406138-1) Avail: NTIS HC A02/MF A01

The time dependent mechanical properties for incompressible polymer like materials subjected to finite deformations are examined. There are two parts: the viscoelastic effects and the aging characteristics. A method for determining these mechanical properties is presented. DOE

N84-31394# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMIC OVERSTRESSES IN FIBROUS POLYMERIC MATERIALS
Robert C. Cook and Michael B. Mercer 11 May 1984 7 p refs Presented at the American Chemical Society Meeting, Philadelphia, 26-30 Aug. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE84-012605; UCRL-90642; CONF-840805-17) Avail: NTIS HC A02/MF A01

The stress redistribution due to filament failure in a sheet of parallel filaments which carry normal loads which are embedded in a matrix which carries only shear were analyzed. The filaments which were replaced by chains of harmonically coupled masses and the shear acts only between mass points on neighboring chains were studied. The study of a discrete system is to reduce the lower end of the scale of applicablity of the model to the molecular level. The molecular dynamics techniques allow investigation of the three dimensional problem. DOE

N84-31395# Oak Ridge National Lab., Tenn.
OBSERVATIONS ON THE SLIDING WEAR OF CERAMICS
C. S. Yust and F. J. Carignan (Advanced Mechanical Technology, Inc.) 1984 23 p refs Presented at the American Society of Lubrication Engineers Meeting, Chicago, 1 May 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE84-012344; CONF-8405176-1) Avail: NTIS HC A02/MF A01

Modern design concepts for heat engines with increased thermal efficiency call for the utilization of ceramic components. A need exists for an expanded understanding of the dry sliding wear behavior of ceramics. Sliding wear experiments were performed on several ceramic pairs (ZrO2, Al2O3, Si3N4, SiC) from which wear rate data and information on the nature of the physical damage resulting from dry sliding were obtained. The wear evaluation is a pin on disc test. The test conditions included temperatures as high as 425(0)C, a surface velocity of 0.3 m/s, and a normal force of 9.0 N. Most of the specimens experienced moderate to severe damage. Mild wear was observed in a single room temperature test. The coefficient of friction for the damaged specimens ranged from 0.7 to 1.0, while this value was consistently 0.24 for the undamaged specimen. The implications of these results for wear mechanisms are discussed. DOE

N84-31396# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SURFACE MODIFICATION AND COATINGS: A TECHNICAL ASSESSMENT
H. G. Tompkins Apr. 1984 29 p refs
(Contract DE-AC07-76ID-01570)
(DE84-012483; EGG-SCM-6577) Avail: NTIS HC A03/MF A01

The processes of surface alteration and coating are reviewed. The surface alteration assessment focuses on laser surface melting whereby a rapid solidification effect is obtained. The assessment on coatings reviews physical vapor deposition (PVD), chemical vapor deposition, and spraying techniques. The assessment focuses on the PVD technique of sputter deposition. The relationship between rapid solidification and the various processes is discussed. DOE

N84-31397# Centre Technique des Industries Mecaniques, St. Etienne (France).
BONDING PROSPECTIVES IN JAPAN Final Report [PROSPECTIVE COLLAGE AU JAPON]
H. Ancenay Jun. 1983 130 p refs Partly in FRENCH, ENGLISH and JAPANESE
(CETIM-100-14-0) Avail: NTIS HC A07/MF A01

Japanese manufacturers and users of adhesives and institutes doing research on adhesion were surveyed. Main growth areas are in automobiles, electronics and household goods. Author (ESA)

N84-31398# Centre Technique des Industries Mecaniques, St. Etienne (France).
CREEP OF SIX GLUES Final Report [FLUAGE DE SIX COLLES]
D. Benazet, H. Ancenay, and Y. Noblet May 1983 143 p refs In FRENCH
(CETIM-1.3N.16.2) Avail: NTIS HC A07/MF A01

The adhesive properties of polyurethane, epoxy, and acrylic industrial glues were tested. Static fatigue tests were carried out for 5000 hr at temperatures of 40 and 70 C and 95% humidity. Results of 4 yr exposure in industrial environments are also presented. Author (ESA)

N84-31399# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Laboratoire de Thermophysique.
CALORIMETRIC AND THERMOGRAVIMETRIC ANALYSIS APPLIED TO INDUSTRIAL POLYMERS [ANALYSE CALORIMETRIQUE ET THERMOGRAVIMETRIQUE APPLIQUEE AUX POLYMERS INDUSTRIELLES]
Guy Beauhaire 1984 29 p In FRENCH Presented at the Soc. Franc. des Ingr. Plasticiens Day sur du Lab. a l'Atelier de Transformation: Methodes Mod. d'Invest. des Matieres Plastiques de la Struct. aux Proprietes, Paris, 17 Nov. 1983
(SNIAS-841-551-101) Avail: NTIS HC A03/MF A01

The use of calorimetric and thermogravimetric techniques to analyze heat setting and thermoplastic polymers is reviewed. Microcalorimetry can be used to determine specific heat, vitreous transitions, latent heat of fusion, and polymerization heat. Thermogravimetry is used to study thermal stability degradation kinetics, and to evaluate the effect of a particular component in a mix, e.g., the influence of water content. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-31400# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
LASER INDUCED CHEMISTRY. 1984 JPM SPECIALIST SESSION
Leland B. Piper, ed. Feb. 1984 82 p refs Meeting held in New Orleans, 7 Feb. 1984
(Contract N00024-83-C-5301)
(AD-A142922; CPIA-Publ-400) Avail: NTIS HC A05/MF A01 CSCL 21/9

The use of lasers in the thermal decomposition of nitramines and alkyl phosphites, laser-induced polymerization in solid propellant binders, laser-induced nitration of hydrocarbons, and the kinetics of the C2 + O2 system were addressed. For individual titles, see N84-31401 through N84-31405.

N84-31401# Naval Research Lab., Washington, D. C. Chemistry Div.

SHOCK-INITIATED DECOMPOSITION OF NITRAMINES WITH LASER DIAGNOSITCS

M. E. Umstead, D. S. Y. Hsu, and M. C. Lin *In* APL Laser Induced Chem. 1984 JPM Spec. Session Feb. 1984 p 1-14 refs (For primary document see N84-31400 21-28)
Avail: NTIS HC A05/MF A01 CSCL 21/9

The kinetics and mechanisms of the thermal decomposition of dimethylnitrosamine (DMNSA) and dimethylnitramine (DMNA) were investigated at high temperatures in shock waves. The complete understanding of the mechanisms of these model molecules is an important step towards understanding the complex chemistry of the decomposition of larger nitramines such as RDX and HMX. The decomposition of both DMNSA and DMNA was studied with and without added NO2 in a shock tube equipped with a stabilized CW CO laser lasr to probe NO formation and a CW Hg lamp operating at 254 nm to monitor the parent molecules. Kinetic modeling of the observed time-resolved data suggests that the reaction of (CH3)2N with NO2 is the key initial chain-propagation step in the DMNA decomposition reaction. Author

N84-31402# Army Missile Lab., Redstone Arsenal, Ala. Research Directorate.

CO2 LASER DECOMPOSITION OF THE ALKYL PHOSPHITES

J. A. Merritt, A. E. Stanley, and J. K. McDonald *In* APL Laser Induced Chem. 1984 JPM Spec. Session Feb. 1984 p 15-26 (For primary document see N84-31400 21-28)
Avail: NTIS HC A05/MF A01 CSCL 21/9

The thermal decomposition of gaseous trimethyl phosphite (CH3O)P was investigated using laser irradiation. Trimethyl phosphite was irradiated for 20 sec with a 25 W CO2 laser. Spectra of trimethyl phosphite before and after irradiation are shown, and decomposition products are enumerated. The effect of the addition of oxygen (O2) to a pure sample of trimethyl phosphite prior to laser irradiation was also examined. The trimethyl phosphite was completely decomposed, and methanol was observed. R.S.F.

N84-31403# Army Missile Command, Redstone Arsenal, Ala.

LASER INDUCED POLYMERIZATION REACTIONS IN SOLID PROPELLANT BINDERS

O. E. Ayers, P. J. Marcucci, and J. A. Murfree *In* APL Laser Induced Chem. 1984 JPM Spec. Session Feb. 1984 p 27-40 (For primary document see N84-31400 21-28)
Avail: NTIS HC A05/MF A01 CSCL 21/9

The effect of ultraviolet and visible laser irradiation in conjunction with various organometallic catalysts on the formation of solid propellant binders was examined. The results of monochromatic radiation on these photocatalyzed reactions at 266 nm, 355 nm, and 532 nm are reported. It is shown that significant enhancement of the polymerization rate of organometallic catalyzed polyol-isocyanate reactions is obtainable with Nd:YAG ultraviolet laser radiation. This enhancement is wavelength and catalyst depndent. While the precise mechanism is not known, the photorate enhancement appears to be dependent on the formation of an activated metalisocyanate complex. With the exception of dibutyltin diacetate, (DBTDA), the only additives which gave enhanced photochemical activity at 266 nm, 355 nm, and 532 nm were those organometallic compounds containing iron as the central metal atom. This evidence suggests it is possible to use laser radiation to enhance and control urethane formation reaction rates. R.S.F.

N84-31404# Army Missile Command, Redstone Arsenal, Ala.

LASER INDUCED NITRATIONS OF SOME ALIPHATIC HYDROCARBON COMPOUNDS

L. C. Warren, O. E. Ayers, W. W. Wharton, J. A. Murfree, and P. J. Marcucci *In* APL Laser Induced Chem. 1984 JPM Spec. Session Feb. 1984 p 41-54 (For primary document see N84-31400 21-28)
Avail: NTIS HC A05/MF A01 CSCL 21/9

Nitration reactions under conditions of laser irradiation were investigated. New methods were sought to prepare useful ingredients containing energetic groups such as NO2 and NO3 for use in propellants. Alkyl bromides and olefins (alkenes) were irradiated with a CO2 laser. The major difference in the reactions of the olefins and alkyl bromides was the amount of irradiation time needed to form the nitro compound. The olefins took less time and gave considerably more product. The results were substantiated with mass spectroscopy. R.S.F.

N84-31405# Los Alamos Scientific Lab., N. Mex. Chemistry Div.

DISAPPEARANCE RATES OF C2(a 3 Pi u) AND C2(X 1 SIGMA g +) WITH O2 OVER THE TEMPERATURE RANGE 298-1300 DEG K

S. L. Baughcum, A. Hartford, Jr., R. C. Oldenborg, and F. B. Wampler *In* APL Laser Induced Chem. 1984 JPM Spec. Session Feb. 1984 p 55-78 (For primary document see N84-31400 21-28)
Avail: NTIS HC A05/MF A01 CSCL 21/9

The kinetics of the C2 + O2 systerh in he 298 K to 1300 K temperature range was studied using double resonance laser-induced fluorescence (LIF). Radicals were produced by pulsed excimer laser photolysis. The radical population was investigated by LIF. The chemical lifetime of the radicals was measured by varying the time delay between excimer laser and LIF probe. Temperature and reactant pressure were varied. R.S.F.

N84-31406# American Defense Preparedness Association, Washington, D. C.

ANNUAL MEETING OF THE PYROTECHNICS AND EXPLOSIVES APPLICATIONS SECTION ON THE AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

29 Sep. 1983 289 p Meeting held at Fort Worth, Tex., 27-29 Sep. 1983
(AD-A143157; AD-E750921) Avail: NTIS HC A13/MF A01 CSCL 19/1

Proceedings of the Annual Meeting of the Pyrotechnics and Explosives application section on the American Defense Preparedness association are presented. Topics of discussion include: Pod Separation System; Forward and Aft Separation Bolts for the NASA Shuttle Solid Rocket Separation System; Use of TLX Energy Transfer Lines on the F-16 Aircraft; The Mathematical Foundation for the 'Ridge-Cut' Technique Used in Explosive Bolts; Nonprimary-Explosive, Hot-Wire Detonator; Environmental Assessment of Smoke and Obscurant Pyrotechnic Materials; Visible Spectra of Standard Navy Colored Flares; A Low Energy Rocket Motor (LERM) for Use With Smoke Countermeasure Projectiles; Sprays and Submunitions - Two concepts for the 81 mm smoke cartridge; Electrostatic and Electromagnetic Resistant Blasting Caps, Squibs and Cartridges, Use of High Pressure Water Jets to Wash Out Explosives; A Scientific Method of Determining the Useful Life of Explosive Devices in Aircraft; U.S. Army Pyrotechnic Safety Enhancement Program - Pyrotechnic protective clothing; Controlled Fragmentation of Tapered Cylinders; and Development of a 35-Second Delay Cutter for the SRB Parachute. GRA

N84-31407# Department of the Army, Washington, D. C.

POROUS CATALYTIC METAL PLATE DEGENERATION BED IN A GAS GENERATOR Patent Application

T. G. Roberts, inventor (to Army) Filed 3 May 1984 7 p
(AD-D011078; US-Patent-Appl-SN-606729) Avail: NTIS HC A02/MF A01 CSCL 21/9

A gas generator for passing pressurized liquid monopropellants therethrough for causing exothermic decomposition of the monopropellants. A porous catalytic metal plate is used as the degeneration bed. The monopropellant decomposes exothermically upon contact with the catalytic plate. The porosity is obtained by making the plate form an alloy of the catalyst metal and one other metal, the other metal is then etched away by an acid that does not attack the catalyst metal. The porosity is controlled by the amount of other metal used. Surface areas of several hundred times the original plate surface area are obtainable. The mechanical characteristics of the metal plate allow for greater design flexibility than was available with decomposition beds made of refractory material. Author (GRA)

N84-31408# Department of the Army, Washington, D. C.
THIXOTROPIC FLAME INHIBITORS FOR ROCKET PROPELLANT GRAINS Patent Application
H. C. Allen, inventor (to Army) Filed 30 May 1984 16 p
(AD-D011081; US-Patent-Appl-SN-615413) Avail: NTIS HC A02/MF A01 CSCL 21/9

Disclosed is a thixotropic flame inhibitor for a rocket propellant grain including an organic thixotrope in amounts from about 5 parts to about 30 parts into HTPB(Hydroxy-Terminated Polybutadiene) liquid polymer in amounts from about 70 parts to about 95 parts by stirring at elevated temperatures. After cooling the mixture to room temperature, appropriate quantities of di- or polyfunctional isocyanates and cure catalysts are added to promote cure at room temperature. Fine particulate matter may also be added to increase viscosity. The resulting formulation is a room-temperature curable, thixotropic mixture which will not flow under its own weight when applied to wettable non-horizontal surfaces in appreciable thicknesses, and which, when cured, is suitable as an inhibitor for composite solid rocket propellants. GRA

N84-31409# Brookhaven National Lab., Upton, N. Y.
ACTIVITIES AT THE BROOKHAVEN NATIONAL LABORATORY INTEGRATED TEST BED FOR ADVANCED HYDROGEN TECHNOLOGY
P. D. Metz and R. W. Leigh Jan. 1984 9 p refs Presented at 5th World Hydrogen Energy Conf., Toronto, 15 Jul. 1984
(Contract DE-AC02-76CH-00016)
(DE84-010226; BNL-34391; CONF-840702-6) Avail: NTIS HC A02/MF A01

An Integrated Test Bed to illustrate renewable energy based hydrogen energy systems was developed. A coordinated program of system testing, computer simulation, and economic analysis was developed to characterize and optimize these systems. The use of solar energy to produce hydrogen from water via photovoltaic powered electrolysis was investigated. The results of recent transient simulations of PV-electrolyzer systems is measured. The transient simulation program TRNSYS was used, with existing, modified, or new component subroutines as required. The PV array power and voltage ratings were found. It is shown that the PV array voltage which maximizes hydrogen production is quite near the nominal electrolyzer voltage for a wide range of PV array powers. DOE

N84-31410# Brookhaven National Lab., Upton, N. Y.
WATER VAPOR ELECTROLYSIS: SYSTEMS CONSIDERATIONS AND COST/PERFORMANCE BENEFITS
F. J. Salzano, G. Skarperdas, and A. Mezzina Jan. 1984 15 p refs Presented at 5th World Hydrogen Energy Conf., Toronto, 15 Jul. 1984
(Contract DE-AC02-76CH-00016)
(DE84-007389; BNL-34233; CONF-840702-4) Avail: NTIS HC A02/MF A01

The energy intensiveness of conventional liquid water electrolysis has inhibited the universal acceptance of this established technology as a resource conversion, storage and transport option. New developments focused on reducing electric energy requirements and overall system capital cost. Major gains are envisioned in meeting these goals if water vapor electrolysis were conducted at elevated temperatures. The fundamental thermodynamics of a high temperature electrolysis process operating at approx. 1000(0) C are presented. Process considerations are examined for engineering requirements. Process tradeoffs are discussed for overall thermal efficiencies, voltage/thermal requirements, steam conversions and heat recovery. It is suggested that high temperature electrolyzers wil operate most cost effectively when balance of system complexity and cost are minimized. DOE

N84-31411# Brookhaven National Lab., Upton, N. Y.
RATIONALE FOR US DOE ENERGY STORAGE PROGRAM IN HYDROGEN TECHNOLOGY
M. Beller and A. Mezzina Jan. 1984 12 p refs Presented at 5th World Hydrogen Energy Conf., Toronto, 15 Jul. 1984
(Contract DE-AC02-76CH-00016)
(DE84-010225; BNL-34204; CONF-840702-2) Avail: NTIS HC A02/MF A01

A multi-year research and development plan based on a systematic evaluation of the mission of the Chemical/Hydrogen Energy Systems Program (C/HES) was developed. The methodology is to systematically examine the important facets of the energy system. These are supply, storage, transmission and distribution, and end use (consumption). Within these sectors, all options are examined and ranked according to a set of attributes which are of importance economically, environmentally, and institutionally. This multi-attribute ranking system is useful not only from the total score obtained, but in evaluating those individual attributes where R and D needs are pointed out. Finally, the results of the analysis are used to delineate areas and priorities for technology base R and D. A systems analysis of the present status and future potential of various hydrogen production, storage, transmission, and use options are provided. Research and development priorities should focus upon these options in the order stated above. DOE

N84-31412# Santa Clara Univ., Calif.
RESEARCH AND DEVELOPMENT OF ALCOHOL FUEL USAGE IN SPARK IGNITED ENGINES Monthly Progress Report
Apr. 1984 8 p
(Contract DE-FG03-84CE-50036)
(DE84-011177; DOE/CE-50036/T2) Avail: NTIS HC A02/MF A01

Progress is reported on the following: cold start studies, computer modeling of cold starting, cold start droplet preparation studies, corrosion and wear study, smog chamber experiments, Toyota Cressida, and the CVS data reduction program upgrade. DOE

N84-31413# Department of Energy, Washington, D. C.
METHOD OF MAKING FINE-GRAINED TRIAMINOTRINITROBENZENE Patent Application
Theodore M. Benziger, inventor (to DOE) Filed 26 Jul. 1983 8 p
(Contract W-7405-eng-36)
(DE84-012754; US-Patent-Appl-SN-517531) Avail: NTIS HC A02/MF A01

A method for forming a fine grained species of the insensitive high explosive sym-triaminotrinitrobenzene (TATB) without grinding is presented. In accordance with the method, 1,3,5-trichloro-2,4,6-trinitrobenzene (TCTNB) is aminated by reaction with gaseous ammonia in an emulsion of toluene in water. The ratio of water to toluene in the emulsion is selected so that toluene is the dispersed phase in the emulsion. The size of the dispersed TCTNB containing toluene droplets determining the particle size of the resulting TATB. The emulsion is preferably formed with an emulsifier such as ammonium oleate, which may be generated in situ from oleic acid, and stabilized with a protective colloid such as polyvinyl alcohol. DOE

N84-31414# Argonne National Lab., Ill.
ECONOMICS OF HYDROGEN PRODUCTION: THE NEXT 25 YEARS
Linda L. Gaines and Alan M. Wolsky Mar. 1984 12 p refs Presented at the 5th World Hydrogen Energy Conf., Toronto, 15 Jul. 1984
(Contract W-31-109-eng-38)
(DE84-007279; CONF-840702-3) Avail: NTIS HC A02/MF A01

The costs are projected through 2010 of hydrogen produced in the US using four commercially available technologies (electrolysis and three fossil-fuel processes). The projections are based on estimated capital costs and real energy prices projected by five sources. The sensitivity of hydrogen cost to changes in feedstock costs and the fixed charge rate on capital is examined. The cost is stable against variation in feedstock prices because feedstocks can be changed. The timing of any such change would depend on the capital charge rate. The results establish cost goals for new technologies attempting to penetrate the market for chemical hydrogen; they also indicate the economic competitiveness of

conventionally produced hydrogen in the fuel market. In 2010, hydrogen delivered to customers will be more expensive than methane, its strongest competitor, and any transition to a hydrogen economy in the US will not yet have begun. In nations with higher oil and gas costs or lower electricity costs, such a transition could occur earlier. DOE

N84-31415# Washington State Energy Office, Olympia.
COST EFFECTIVENESS OF CONVERTING TO ALTERNATIVE MOTOR VEHICLE FUELS. A TECHNICAL ASSISTANCE STUDY FOR THE CITY OF LONGVIEW
G. A. McCoy 18 Nov. 1983 64 p refs
(Contract DE-FG06-79R0-00003)
(DE84-010479; WAOENG-83-48; WS-LGTA-83-12) Avail: NTIS HC A04/MF A01

The city of Longview can obtain significant fuel savings benefits by converting a portion of their vehicle fleet to operate on either compressed natural gas (CNG) or liquid petroleum gas (LPG) fuels. It is indicated that 39.6 months are required for the CNG fuel savings benefits to offset the initial or first costs of the conversion. The conversion of fleet vehicles to liquid petroleum gas (LPG) or propane produces comparable savings in vehicle operating costs. A payback analysis indicates that 27.7 months are required for the fuel savings benefits to offset the initial LPG conversion costs. DOE

N84-31416# National Academy of Sciences - National Research Council, Washington, D. C. Advisory Committee on Technology Innovation.
PRODUCER GAS: ANOTHER FUEL FOR MOTOR TRANSPORT
1983 108 p refs Sponsored in part by the Agency for International Development
(DE84-901066; NP-4901066) Avail: NTIS HC A06/MF A01

Producer gas is generated from solid fuels such as wood, charcoal, coal, peat, and agricultural residues. Although was largely overlooked for the past 30 years. Basically, producer gas is made when a thin stream of air passes through a bed of glowing coals. The coals may come from burning of wood, charcoal, coke, coal, peat, or from wastes such as corn cobs, peanut shells, sawdust, bagasse, and paper. The gas is generated in a gasifier - a metal tank with a firebox, a grate, air inlets, and an outlet for the gas produced. It consists of carbon monoxide and hydrogen. In the cylinder of a spark-ignition gasoline engine the gas can be ignited in the usual way with the existing spark plugs. In diesel engines, producer gas by itself will not ignite. However, diesel equipment may be operated on producer gas. The gas is mixed with the combustion air and then a small amount of diesel fuel is injected into the cylinders to provide ignition. This book describes producer gas technology and its history. DOE

N84-31417# Rice Univ., Houston, Tex.
PHASE AND VOLUMETRIC STUDIES FOR METHANE/SYNTHESIS GAS SEPARATIONS: THE HYDROGEN-CARBON MONOXIDE-METHANE SYSTEM Final Report, Jan. 1979 - Dec. 1983
R. Kobayashi, J. Hong, J. W. Magee, and M. D. Jett 15 Mar. 1984 138 p refs Sponsored by Gas Research Inst.
(PB84-214394; GRI-84/0084) Avail: NTIS HC A07/MF A01 CSCL 21D

Vapor-liquid-equilibrium (V-L-e) data for the hydrogen methane carbon monoxide system at cryogenic temperatures and elevated pressures and Phase and Volumetric Temperature PVT data for the same system from -190 to 400 C at pressures up to 10,000 psi are obtained. Reliable methods of predicting the physical properties of natural gas mixtures are necessary for metering and in designing transport, separation and purification equipment associated with gaseous fuels. The separation of synthesis gas consisting of various concentrations of hydrogen and carbon monosice from methane and other light hydrocarbons is a major step in the manufacture of Synthetic Natural SNG from coal. Since the separation(s) must be conducted at cryogenic temperature, it is energy intensive. This data provides critical tests of predictive equations for fluid mixtures. GRA

N84-31237# Joint Publications Research Service, Arlington, Va.
ADVANTAGES OF METALLIC FUELS FOR ROCKET PROPULSION
Ya. I. Karker and G. Yu. Mazing *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 124-131 Transl. into ENGLISH from Khim. i Zhizn (Moscow), no. 12, Dec. 1983 p 80-84
(For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-31418# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
TURNING OF HARDENED FERROUS METERIALS WITH HOMOGENEOUS CBN TOOL TIPS
H. J. Burmester and H. G. Burmester 1983 9 p refs Transl. into ENGLISH from TZ fuer Metallbearbeitung (West Germany), v. 75, no. 7, Jul. 1981 p 39-40
(CSIR-Trans-1728) Avail: NTIS HC A02/MF A01

The properties of amborite, presented in the form of homogeneous polycrystalline boron nitride disposable tool chips, are discussed. In its physical properties Amborite differs substantially from commonly used conventional cutting media (high speed steel, sintered carbides, cemented oxides) and approaches diamond in hardness while coming between cemented oxides and K10 sintered carbide in bending strength. The thermal conductivity of Amborite is vastly superior to that of cemented oxide and approaches that of metallic abrasives with the result that thermal stresses in the cam remain negligible during both interrupted and cooled cutting, eliminating the risk of stress cracks as encountered with cemented oxides. The great hardness of Amborite permits a reduction in cutting forces, which partly consist of frictional forces in turn determined by hardness differences between material and cam. In cutting behavior Amborite resembles sintered carbide rather than cemented oxide and like the former is subject to cratering wear of the cutting surface. DOE

N84-31419# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
NEW SAPPHIRE AND RUBY COMPONENTS AND THEIR MANUFACTURE USING DIAMOND ABRASIVES
D. Sauser 1983 12 p Transl. into ENGLISH from Ind. Diamenten Rundschau (Switzerland), v. 15, no. 3, 1981 p 181-185
(CSIR-Trans-1734) Avail: NTIS HC A02/MF A01

The properties of synthetic aluminum oxides (sapphire and ruby) and their applications in watchmaking (watch bearings and watchglasses) and as hard-wearing components such as centering devices for optical fibres and water jet nozzles for material cutting are discussed. Examples are given of the use of diamonds tools for machining such components, including sawing, drilling, grinding and polishing operations. R.J.F.

N84-31420# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
GRINDING WITH BORAZON: PROGRESS AND REWARDS
D. Borse 1983 29 p refs Transl. into ENGLISH of TZfuer Metallbearbeitung (West Germany), v. 66, no. 1, 1972 p 1-8
(CSIR-Trans-1718) Avail: NTIS HC A03/MF A01

Numerous problems in the grinding of high-speed steels, high-carbon chrome steels and anti-wear linings are solved using Borazon, a cubic crystalline boron nitride. Practical results obtained in grinding trails are examined and the known capabilities of Borazon are described. Focus is on the importance of using the correct grinding method. The special properties of Borazon are compared with those of diamond. Diamond specific causes of wear are indicated. A.R.H.

N84-31421# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
INTERNAL GRINDING OF HIGH-SPEED STEELS: SHORTER PROCESSING TIMES WITH BORON NITRIDE GRINDING TOOLS
D. Borse 1983 5 p Transl. into ENGLISH from VDI Nachrichten (West Germany), v. 16, 1970 p 34
(CSIR-Trans-1719) Avail: NTIS HC A02/MF A01

Boron nitride grinding tools can be used to advantage for the grinding of high speed steel (HSS) with a high vanadium content. the abrasives available to date are of limited value because the HSS materials contain very hard carbides, grinding of which, and of vanadium carbide in particular, results in very rapid wear in silicon carbide or corundum grinding wheels. The hardness of these steels is usually 62 RC to 70 RC. Boron nitride grinding tools are advantageous for internal grinding of workpieces made of high speed steel for example, sockets, milling tool bores, cutting wheels and crushing rollers. To date, boron nitride grinding wheels or pencil grinders were bonded with synthetic resin. Consequently internal grinding is usually carried out as wet grinding. In the meantime grinding tools bonded with electrodeposited metal bonds (GSS) were developed and proved to be successful for internal grinding. The abrasive grains which are arranged in a single layer protrude freely from the electrobond. During grinding very little heat is generated, so that dry grinding is possible. R.J.F.

N84-31422# Centre Technique des Industries Mecaniques, St. Etienne (France).
AUTOMATION OF A STAMPING PRESS USING SEQUENTIAL HYDRAULIC MANIPULATORS Final Report [AUTOMATISATION D'UNE PRESSE D'EMBOUTISSAGE TRAVAILLANT EN REPRISE, AU MOYEN DE MANIPULATEURS SEQUENTIELS PNEUMATIQUES]
J. P. Devimeux, V. Escalup, B. Hoessler, M. Orriols, and R. Thomas Sep. 1983 81 p refs In FRENCH
(CETIM-1-4N-060) Avail: NTIS HC A05/MF A01

The economic and technical feasibility of using pneumatic manipulation to automate a metal sheet stamping press was tested on a 2000 kN commercial machine. Results show that the pneumatic system is slower and less flexible than electromechanical methods. However, costs are lower and the system is interesting in cases of large series of work on slower machines, on curved pieces, for special work cycles, and linked to other machines.
Author (ESA)

N84-31423# Centre Technique des Industries Mecaniques, St. Etienne (France). Service Forge.
AUTOMATION OF A DROP FORGE AT THE CENTRE TECHNIQUES DES INDUSTRIES MECANIQUES (CETIM) FORGE SECTION Final Report [AUTOMATISATION D'UNE PRESSE D'ESTAMPAGE A LA CELLULE FORGE DU CETIM]
G. Batit, B. Kaczmarek, G. Rouchouse, and J. P. Devimeux Aug. 1982 55 p In FRENCH
(CETIM-1.3K.27.3) Avail: NTIS HC A04/MF A01

A 3200 kN mechanical press was automated using equipment already existing. It has a 40 kW inductive heat generator. The manipulators and software are described. Performance is limited by the equipment used, but the system works well and was used to study nitriding of dies and for quantitative forecasting studies of die wear. Author (ESA)

N84-31424# Centre Technique des Industries Mecaniques, St. Etienne (France).
INDUSTRIAL FORGING APPLICATIONS OF SHAPING SIMULATION USING MODELING CLAY Final Report [APPLICATIONS INDUSTRIELLES EN FORGE DE LA SIMULATION DE LA MISE EN FORME AVEC DES PATES A MODELER]
P. Ravassard and C. Bournicon Sep. 1982 80 p refs In FRENCH
(CETIM-1.3K.36.2) Avail: NTIS HC A05/MF A01

The use of Plasticine and similar modeling materials to simulate forgings is advocated. It permits low cost studies of complex processes for manufacturing or training purposes without interfering with work schedules of real machines. Criteria for choosing a clay, construction of dies, equipment, and laboratory procedures are described. Author (ESA)

N84-31425# Centre Technique des Industries Mecaniques, St. Etienne (France).
CONSTRUCTION OF A TEST BENCH FOR CLOSED DIE FORGING Final Report [REALISATION D'UN BANC D'ESSAI DE FORGEAGE EN MATRICES FERMEES]
G. Batit, B. Kaczmarek, and P. Ravassard Mar. 1984 11 p In FRENCH
(CETIM-5.580.50) Avail: NTIS HC A02/MF A01

A swan neck press was equipped with hydraulic jacks to enable it to press and forge complex shapes in closed dies in one operation without wasting metal. Maximum closing stress is 250 kN, maximum pressing stress is 250 kN, maximum forging stress is 70 kN. Author (ESA)

N84-31426# National Bureau of Standards, Washington, D.C. National Engineering Lab.
LABORATORY EVALUATION OF THE STEADY-STATE AND PART LOAD PERFORMANCE OF ABSORPTION TYPE HEATING AND COOLING EQUIPMENT
Reinhard Radermacher, Mark McLinden, Sanford Klein, and David Didion Mar. 1984 93 p refs Sponsored in part by DOE
(PB84-182146; NBSIR-84-2816) Avail: NTIS HC A02/MF A01 CSCL 13B

An absorption water chiller and an absorption heat pump were extensively tested under steady state and cyclic operating conditions. Since the tests were performed on two different units, one for a cooling only and one for a heating only application, the results of the testing of each unit are reported separately. In addition to the black box tests of these units, the causes for the degradation during part load operation were investigated in more detail using the absorption chiller. The migration of fluids during the off periods were found to be a major contribution to the degradation. The influence of heating water temperatures, flow rates, and sensitivity of the charge on steady state performance was investigated employing the heat pump. Author (GRA)

N84-31427# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING Abstracts Only
11 Jun. 1984 72 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-84-008) Avail: NTIS HC A04

Research on the following topics is considered: signal processing, electronic systems, antennas, broadcasting, circuits, communications, computers, electrical insulation, electron devices, industrial electronics and control instrumentation, microwave theory, power engineering, quantum electronics, electro-optics, and solid state circuits. For individual titles, see N84-31428 through N84-31453.

N84-31428# Joint Publications Research Service, Arlington, Va.
RESULTS OF INVESTIGATION OF ADAPTIVE SPEECH CODES Abstract only **c32**
A. L. Nekhayev, V. A. Pertseva, and I. V. Sitnyakovskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 1 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 37-39 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

A search for ways of increasing the effectiveness of speech signals in digital form lead to the appearance of various methods of encoding, to reduce the excessiveness of specific properties of the speech signal. It is customary to divide speech codes into two large classes: codes of signal parameters (or vocoders), and codes of the signal form (CSF. In telephony, preference is given to a second class of systems, which maintains naturalness of sound. The class of CSF expanded considerably because of the development of codes based on the frequency representation of a signal. The greatest interest is given to such methods of encoding

as pulse modulation (PCM), differential PCM (DPCM), and delta modulation (DM). However, developers of digital transmission systems find it difficult to compile a complete pattern of the applicability of specific types of codes. The best known versions of the codes are evaluated by means of subjective-statistical measurements of their characteristics. The results obtained help developers to draw conclusions regarding the applicability of the codes considered in various communication systems. Author

N84-31429# Joint Publications Research Service, Arlington, Va.
USE OF SPACE-DIVERSE PHOTORECEIVERS FOR ANALYSIS OF INTERFERENCE PATTERNS Abstract only c32
G. V. Merkishin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 2 Transl. into ENGLISH from Optiko-Mekhan. Promyshennost (Leningrad), no. 11, Nov. 1983 p 13-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Space-diverse discrete photoreceiver arrays are usable for analysis of an interference pattern and for determining the relative locations not only of two reflectors in a known plane, but also of two reflectors with all three coordinate unknown. The corresponding interference pattern consists of oblique fringes with two different space periods along the two orthogonal coordinates in the plane of measurement. The interference pattern is analyzed relative to the gauging distance and to the source dimensions. It is assumed that the finite radius of radiation coherence is negligibly small and that the interference pattern was formed by interaction of waves from high quality reflector surfaces without speckle noise during diffuse scattering. Calculation of the radiation intensity distribution on the input side of the photoreceiver array, typically a rectangular one, and of the signal distribution on its output side indicates how to optimize the space diversity of photoreceivers. Author

N84-31430# Joint Publications Research Service, Arlington, Va.
ADAPTIVE MULTIBEAM ANTENNA ARRAY Abstract only c32
V. I. Novikov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) Jan. 1984 p 3 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelectron. (Kiev), v. 27, no. 1 p 39-44 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

An adaptive multibeam antenna array is considered which will enhance the advantages of a plain one. By providing simultaneous reception of signals from different directions and their sequential processing. The optimization of the array control for maximum interference suppression in the radiation pattern is emphasized. The optimum control is sought with respect to the signal-to-interference power ratio as a genaralized criterion. Sampled useful signals and transmission coefficients are found to be complex-conjugate quantities, assuming compatible formation of beams, so that synphasal equiamplitude addition of signals from all array element is attainable by unique settings of the weight factors. Calculations are simplified by letting the useful signal power in the 1-th beam be approximately equal to the k-th weight factor, before optimizing the weight vector for maximum signal-to-interference ratio. A narrowband interference described by power P and vector V of signal distribution over the array is considered as an example, to demonstrate the algorithm of synthesis. The algorithm, using the Butler matrix, was executed experimentally on a computer for a linear equidistant antenna array of 32 elements with compatible formation of beams. Author

N84-31431# Joint Publications Research Service, Arlington, Va.
TELEVISION TRANSMITTING ANTENNA OF DECIMETER BAND SYSTEM BASED ON TUBES 720 AND 1020 mm IN DIAMETER Abstract only c32
I. Bradach *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 4 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 29-33 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The IV and V television bands (470 to 638 and 638 to 790 MHz) are singled out for further growth of the television networks. In the development of antenna systems for the transmitting stations of these bands, systems based on tetrahedral lattice supports with a width of a tetrahedral face of more than one meter, a number of difficulties appear which are caused by the short length of the transmitted wave. A polar diagram in the horizontal plane of the antenna, the panels of which are arranged on the sides of the tetrahedral supports of such dimensions, substantially differs from the sperical. An acceptable polar diagram, close to spherical, is obtained with transverse dimensions of the load-carrying structure approximately equal to 300 x 300 mm. An antenna system called the Noligan 720 is described and its technical parameters are presented. The dependence is given in a table of the load-carrying capacity of the system and the amplification of the system, with reference to a half-wave dipole, on the length of the feeder. The ADT 7006 antenna panel is described and technical data on it are presented. The system described uses coaxial distribution of four types (AVT 8002, 8013, 8023, and 8062) intended for distribution of high frequency energy. Author

N84-31432# Joint Publications Research Service, Arlington, Va.
ADAPTIVE ANTENNAS FOR TROPOSPHERIC RADIO RELAY LINES Abstract only c32
O. P. Frolov *In its* USSR Rept.: Electron and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 4 Transl. into ENGLISH from Electrosvyaz (Moscow), no. 1, Jan. 1984 p 40-42 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The necessity is shown for developing adaptive antenna devices which guarantee coupling of the signal parameters with the electrical characteristics of the antenna. Single-channel adaptive receiving antenna systems and the parameters of a single-channel adaptive antenna are considered. The basic technical decisions with respect to the structure of adaptive single-channel antennas for tropospheric lines of radio communication as well as the results of experimental investigations of them are discussed in a future paper. Author

N84-31433# Joint Publications Research Service, Arlington, Va.
DESIGN OF SHORT-WAVE ABSORPTION LINES Abstract only c32
Ya. S. Glazman, R. V. Gurevich, and Ye. R. Gurevich *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 5 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 43-46 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Absorption lines which are used as loads for diamond shaped antennas and as equivalents for antennas during tuning operations and transmitter measurements are described. They are designed to disseminate power from one kilowatt up to several hundreds of kilowatts. To do so sufficient good balancing of the absorption line must be provided in broad bands. A traveling wave factor not lower than 0.7 to 0.9 is specified. Absorption lines of several types are listed, and a procedure is presented to calculate the parameters of absorption lines. A graphical calculation method is described and examples of a calculation of two variations of an absorption line are given. E.A.K.

N84-31434# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF NOISE TEMPERATURE OF OPTICAL WAVE-GUIDE Abstract only c32
A. M. Somov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 5 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 46-50 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Optical waveguides employed in Earth satellites communications systems are used instead of antenna waveguide transmission line to increase the noise quality of the receiving systems at Earth point. The special features of operation of an optical waveguide, the noise temperature of the optical waveguide elements with vertical orientation of the directional pattern, and the noise temperature of the optical waveguide are considered. Use of an

open optical waveguide assures operation with a wider frequency band and increases the noise temperature. It is found that in a number of practical instances it is possible, together with the employment of shielded optical waveguides, to use optical waveguides of the open type. It is the noise temperature of such a system is computed by the method presented. E.A.K.

N84-31435# Joint Publications Research Service, Arlington, Va.
EQUIPMENT FOR MONITORING AND CONTROL OF TELEVISION TRANSMITTERS Abstract only c33
M. Krashterka *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 6 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 27-29 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

A method to investigate the characteristics of transistors for common amplification of pictures and sound and which agrees well with experimental data on the use of transistors in high frequency wideband amplifiers for television broadcasting is proposed different types of transistors are considered, and their application in amplification of television broadcasting signals is not recommended. Based on experience with domestic power transistors is found that it is possible to construct a very simple device which assures amplification of the output of television broadcast signals up to 20 Watts. E.A.K.

N84-31436# Joint Publications Research Service, Arlington, Va.
MULTI-CRITERIA APPROACH TO SELECTION OF OPTIMAL CONNECTIONS IN LARGE-SCALE INTEGRATED CIRCUITS Abstract only c33
B. V. Batalov, Ye. P. Lyasnikov, and V. M. Shchemelinin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 7 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 13, no. 1, Jan. 1984 p 3-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

In the design of large scale integrated circuits, the simplest analog model topology involves a comb lay out in which the connection variants according to the scalar criteria of circuit region charge, number of connections and total connection length are determined. The optimization problem is formulated and models for least channel charge, least total connection length and fewest connections and for optimization according oi vector criteria of quality are presented. The lexicographic rank of the vectors according to certain characteristics is introduced and optimization is obtained by a comparison of vector criteria. The lexicographic approach reduces to a sequence of one criterion problems and guarantees the existence of the optimum but requires the enumeration of all equivalent in the decision process. E.A.K.

N84-31437# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF INTEGRATED CIRCUIT ELEMENT DIMENSIONS TAKING INTO ACCOUNT REAL ETCHING PROFILE ACCORDING TO DIFFRACTION PATTERN Abstract only c33
In its USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 7-8 Transl. into ENGLISH from Elektrsvyaz, no. 12, Dec. 1983 p 1-8 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Test diffraction gratings are used to determine linear elements and integrated microcircuits with dimensions approaching one light wavelength and to assess the performance of small topological elements with respect to angular curvature, dimension range and etching conditions were optical means and even electron microscopes are insufficient for objects of approximately 1 micron. Randomly incident diffraction of coherent laser light in relation to grating lines was examined. Fractional spectra for grating elements, taking into account etching slopes are computed. Measurements were made at specific angles of diffraction order intensities, and relatively precise determinations of element dimensions were obtained with a precision of approx. 0.1 micron even for objects smaller than one light wavelength. E.A.K.

N84-31438# Joint Publications Research Service, Arlington, Va.
REALIZATION OF HIGH-FREQUENCY FILTERS ACCORDING TO THEORY OF GUIDED SPHERICAL WAVES Abstract only c33
A. I. Knyaz and V. M. Draganov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 8 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 57-59 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

For the design of filters operating at metric, decimetric, and centimetric wavelengths, their equivalent circuits must and can be refined to allow for an electrodynamically reliable trimmerless construction by satisfying the conditions for spherical T-mode waves at the junctions between filter elements. This principle is demonstrated on a beam filter and its equivalent low pass circuit. A short segment of a transmission line formed by two conical beam conductors serves as a capacitive element; their surface is described by equations in a cylindrical system of coordinates. After the capacitance per unit length of such an element was calculated. The inductance per unit length of an inductive element between two such capacitive elements is calculated as that of a loop formed by two conical beam conductors. Theoretical design and experimental test data indicate that this method is suitable for high frequency beam filters. E.A.K.

N84-31439# Joint Publications Research Service, Arlington, Va.
EFFECT OF ION TREATMENT OF SUBSTRATES ON INITIAL STAGE OF BUILDUP OF METAL FILMS Abstract only c26
A. V. Stepuro, T. S. Turovskaya, G. A. Muranova, and A. F. Perveyez *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 22 Transl. into ENGLISH from Optiko-Mekhan. Promyshlennost (Leningrad), no. 11, Nov. 1983 p 30-34 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The effect of purifying ion bombardment of substrate on nucleation and buildup of metal films was determined. A pretreatment of quartz and K8 glass substrates and subsequent deposition of aluminum, copper and silver films by vacuum evaporation or cathose sputtering took place in a continuous technological cycle without opening of the vacuum chamber. The substrates were bombarded with 1.0 to 1.5 keV argon ions with a current density of 1.0 mZ/sq cm and a surface blasting rate of 1 micron/h. Ion bombardment was found to activate the glass surface and produce free surface bonds, the letter providing artificial nucleation centers for metal films and subsequently increasing the film adhesion. When metal films are deposited by cathode sputtering, their molecules are more likely to migrate over the substrate and merge with the undersirable effect of increasing the dimensional variance of film nuclei. B.G.

N84-31440# Joint Publications Research Service, Arlington, Va.
LARGE-SIGNAL AMPLIFIER BASED ON FERRIMAGNETIC ECHO Abstract only c76
Ye. A. Yegorov and V. A. Kozlov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 25-26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

An echo produced by interaction of natural spin modes in a nonellipsoidal ferritae single crystal, following its excitation by two short microwave pulses in succession, is utilized for amplification. Here large-signal amplification with attendant nonlinearity effects are analyzed, upon solution of the corresponding Landau-Liifshits equation in rectangular coordinates by the perturbation method. The solution is sought in the form of a power series in the normalized magnetization amplitude after the first excitation pulse. On the basis of this solution the dependence was calculated of the first-echo gain on the first-signal power p(sub 1), that power was normalized to the second-signal (pumping) power P(sub 2), and the gain found to be maximum at P(sub 1)/P(sub 2) = 10 to the minus 11th power. The dependence of the first-echo gain and the second-echo gain on the time interval between the two input

signals was also calculated, both gains found to be peaking sharply but the corresponding time interval is shorter for the first-echo gain than for the first-echo gain than for the second-echo gain. Author

N84-31441# Joint Publications Research Service, Arlington, Va.
CIRCUIT ENGINEERING PRINCIPLES FOR CONSTRUCTION OF BIPOLAR LARGE-SCALE INTEGRATED CIRCUIT STORAGE DEVICES AND VERY LARGE-SCALE MAIN MEMORY Abstract only c33
A. A. Neklyudov, V. N. Savenkov, and A. G. Sergeyez *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 27 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 13, no. 1, Jan. 1984 p 15-23 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Memories are improved by increasing speed or the memory volume on a single chip. The most effective means for increasing speeds in bipolar memories are current control circuits with the lowest extraction times for a specific power consumption (1/4 pJ/bit). The control current circuitry involves multistage current switches and circuits accelerating transient processes in storage elements and links. Circuit principles for the design of bipolar memories with maximum speeds for an assigned minimum of circuit topology are analyzed. Two main classes of storage with current control are considered: the ECL type and super-integrated injection type storage with data capacities of $N = 1/4$ and $N > 4/16$, respectively. The circuits reduce logic voltage differentials and the volumes of lexical and discharge buses and control circuit buses. The limiting speed is determined by the antiinterference requirements of the memory in storage and extraction modes. Author

N84-31442# Joint Publications Research Service, Arlington, Va.
DIELECTRIC-GRATING BAND-PASS FILTERS Abstract only c33
A. V. Vodolzhenko and V. B. Kazanskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 10-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The performance and bandpass characteristic of open dielectric waveguide resonators are analyzed theoretically, considering an infinite periodic (along the y-axis) grating of parallel ideally conducting identical rectangular bars separated by dielectric waveguide channels. The structure is symmetric with respect to the xy-plane and the height of the bars is fixed. The width of the dielectric channels is fixed, but their height and the dielectric material are controllable. Calculations are made for a horizontal grating excited from above by a plane monochromatic wave with an H-vector only parallel to the conductors and propagating at an arbitrary angle to the vertical z-axis. The corresponding diffraction problem is solved for the Fourier series coefficients characterizing the scattered field and for the amplitude-frequency characteristic of the grating. Author

N84-31443# Joint Publications Research Service, Arlington, Va.
COLD-CATHODE GAS-DISCHARGE MODULATOR POWER TUBE Abstract only c33
V. P. Andronova, A. M. Arsh, V. I. Krizhanovskiy, A. I. Kuzmichev, and A. I. Shendakov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 32-33 Transl. into ENGLISH from Izv. Ucheb. Zaved: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 85-86 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

A cold-cathode gas-discharge tube were developed for pulse modulation of voltage in such devices as generators of pulse currents and voltages with capacitive or inductive energy storage. The operation is based on magnetic control of space ionization, with the glow region under conditions corresponding to the left-hand branch of the Faschen curve. These features ensure reliable and stable performance, a cold cathode without heater filament saving both energy losses and warmup time. The basic structure of this tube is a coaxial configuration of cylindrical electrodes, with the cathode outside and the anode inside. The electrodes are both made of Kh18N10T stainless steel, both 2 mm thick and, respectively, 120 and 100 mm in diameter. A longitudinal magnetic control field is produced in the interelectrode space and, as the magnetic induction reaches its critical level, discharge is ignited just after a positive voltage pulse was applied to the ignition stabilizing circuit. The maximum anode voltage is 15 kV, current pulses of 20 to 200 microsec duration is generated and a current of at least 1 kA is interrupted under full voltage at repetition rates of 0.1 to 200 Hz with a fall time not exceeding 5 microsec. The performance characteristics of this tube are superior to those of the GMI-37A hot-cathode pulse modulator tube, including a longer than 1000 h life. B.G.

N84-31444# Joint Publications Research Service, Arlington, Va.
REGULATION OF MECHANICAL CHARACTERISTIC OF IRON-POWDER ELECTROMAGNETIC BRAKE Abstract only c37
I. Kh. Khayrullin, V. S. Syromyatnikov, Sh. G. Ismagilov, and R. N. Sultangaleyev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRA-UEE-84-008) 11 Jun. 1984 p 39 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 12, Dec. 1983 p 35-36 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Electromagnetic clutches and brakes operating with iron powder are used in aircraft instrumentation and automation systems because of their favorable performance indicators, particularly high ratio of braking torque to moment of inertia. The braking torque, also the running torque during slipage, can be treated as the sum of a magnetomechanical component (speed-independent interaction of iron particles with one another and with the rotor surface) and an electromagnetic component (speed-dependent interaction of magnetic field crossing the air gap to the rotor with eddy currents induced in the rotor). It is feasible to regulate the corresponding mechanical (speed-torque) characteristic in order to achieve the optimum curve for a given drive system. The regulation system consists of an inductive transducer, a linear rectifier, a function regulator, a voltage divider, and a pulse-width modulator with the output pulse duration controllable by the ratio of pulse duration to switching period. Such a regulation system has been designed at the Institute of Aviation for a brake with variable poles and cylindrical low-inertia rotor mixing iron powder in the air gap. Performance calculations indicate a linearly increasing parabolic speed-torque curve with a linearization error not exceeding 5%. Author

N84-31445# Joint Publications Research Service, Arlington, Va.
OPERATING MODES OF SUPERCONDUCTING CURRENT CONVERTERS IN SERVICE Abstract Only c33
V. Ye. Ignatov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-Uee-84-008) 11 Jun. 1984 p 39 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 12, Jan. 1983 p 41-44 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The operation of ac-to-dc converters for superconducting inductive loads such as cryogenic electric machines or magnetic separators is analyzed from the standpoint of energy balance and performance characteristics. On the basis of theoretical relations and measurements made in an experimental test stand, respective curves have been calculated depicting the dependence of load current on number of converter cycles in two basic modes of operation: (1) energy flow from converter to motor; (2) energy flow from generator to converter. The results are useful for design purposes and indicate the feasibility of continuous-duty operation with frozen in energy flux in stationary power plants. Author

N84-31446# Joint Publications Research Service, Arlington, Va.
INFRARED ELLIPSOMETER METHOD FOR DETERMINATION OF PARAMETERS OF THIN EPITAXIAL STRUCTURES WITH BURIED LAYER: SPECIMENS WITH DULL INACTIVE SURFACE Abstract only c76

E. S. Lonskiy and V. P. Vasilyev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 41 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 13, no. 1, Jan. 1984 p 74-83 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

In order to increase the efficiency of epitaxial structures with a buried layer, methods are needed for the monitoring and analysis of the technical processes involved in their construction. Nondestructive and contactless infrared measuring methods are preferred for examination of epitaxial film and can be applied to thin epitaxial structures with a buried layer when, because of thickness and impurity concentration, the layer acts as a semiinfinite absorbing substrate. The study analyzes the limits and precision of the infrared ellipsometer method. The model used is based on the replacement of the buried layer in the structure by free carrier concentrations and an infrared ellipsometer method is developed which leads to a model of the real thin epitaxial structures with buried layers, and an approximation of the buried layer doping profile. The distance of the layer from the surface, its thickness and doping can be determined. The model is compared with experimental results. Author

N84-31447# Joint Publications Research Service, Arlington, Va.
PHASE LIGHT RANGE FINDER Abstract only c74
A. D. Nizhenskiy, V. B. Volkonskiy, I. N. Zhukinskiy, V. M. Kodryanskiy, A. G. Kononenko, Yu. A. Masyurenko, Yu. V. Popov, and V. V. Yakovlev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 43 Transl. into EnGLISH from Izmer. Tekh. (Moscow), no. 2, Feb. 1984 p 35-36 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

One of the complex technical problems solved with the assistance of a plane light finder is monitoring of the geometrical dimensions of the antennas of radiotelescopes with large diameters (greater than 25 meters), intended for radioastronomy investigations. The assigned technical characteristics of the radiotelescopes and the effectiveness of its operation are assured by regulation of the antenna profile by the results of measurements of the distance from one fixed point to check points on the surface of the parabolic mirror, the number of which can amount to several thousands. Monitoring of an antenna profile by this method provides for use of laser range finders which assure measuring of 10-100 meter distances with high precision (error of measurement 0.1 to 0.4 mm) and speed of response (measurement time - units of a second). A phase light range finder which satisfies the indicated requirements is considered and described in detail. Author

N84-31448# Joint Publications Research Service, Arlington, Va.
MICROWAVE PHASE MODULATORS USING SEMICONDUCTOR DIODES (SURVEY) Abstract only c33
A. A. Makarenko *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 45 Transl. into English from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 3-10 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Microwave phase modulators are basically classified into linear And discrete ones. The former are built with p-n diodes, Schottky-barrier diodes, or IMPATT diodes. The latter are built with the same diodes, but most often with p-i-n diodes. Although linear phase modulators can be designed in two possible versions, namely as reflecting or transmitting phase shifters, discrete phase modulators can also be designed in the form of phase shifters with switching of channels or as combinations of low-pass filters and high pass filters. The main performance parameters of both types, determied principally by those of the respective semiconductor diodes, are linearity and slope of the modulation characteristic, nominal modulation index and level of parasitic amplitude modulation, and range of modulating frequencies. Other parameters common to both types are range of operating microwave frequencies, power loss on the modulator, standing-wave ratio, control power, and performance stability during fluctuations of ambient temperature or input power. Discrete phase modulators are, in addition, characterized by a permissible microwave input signal level, and the number and magnitude of phase discretization steps for the given accuracy and speed requirements. B.W.

N84-31449# Joint Publications Research Service, Arlington, Va.
ALTERNATING ACOUSTOELECTRIC CURRENT GENERATED BY INTERACTION OF TWO WAVES IN ACOUSTIC MICROWAVEGUIDE Abstract only c71
G. I. Bulakh and I. V. Ostrovskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 83-85 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 83-85 Document announced as A84-22564 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

An experiment was carried out to study acoustoelectric current generated at sum and difference frequencies as the result of electron concentration nonlinearity in the case of the interaction of ultrasonic waves. Particular consideration was given to the interaction of ultrasonic Lamb waves in single-crystal CdS plates several tens of microns thick. The dependence of currents at sum and difference frequencies on crystal conductivity in the interaction region is investigated, and the existence of a characteristic maximum is disclosed. Author

N84-31450# Joint Publications Research Service, Arlington, Va.
CALCULATION OF HYDRAULIC FRICTION LOSSES IN dc MOTORS FILLED WITH LIQUID DIELECTRIC Abstract only c33
V. P. Morozkin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 49-50 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 1, Jan. 1984 p 55-57 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Hydraulic friction during rotation of the armature in a dc motor filled with liquid dielectric is a major source of power loss, up to 40% of all power losses in such a motor. These losses are usually reduced by impregnating the end turns of armature coils with a compound and smoothing their outside surfaces. Hydraulic losses are best determined experimentally on a model armature and then calculated according to the theory of similarity for any other motor. This was with the armatures of DPK-8-3000, DPK-08-1000 small motors and P-42, Mu-52 large motors as test models. For subsequent calculations the armature is treated as a structure consisting of three cylinders: (1) slotted wound active core rotating inside a stationary cylinder with a radial gap between them; (2) end turns of coils rotating in free space; and (3) slotted commutator rotating in free space. The back plate of the armature constitutes a rotating disk. Considering that the hydraulic drag coefficient is a function of the Reynolds number only, it is calculated for each component of the armature on the basis of semiempirical relations with length and radius, gap width between stator (field) bore and active rotor core, angular velocity or rpm, and density of the dielectric as parameters. The resultant hydraulic drag coefficient is found by weighted combining of the four partial ones, with use of diameter ratios and a length-to-diameter ratio for the active core. R.J.F.

N84-31451# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE CHARACTERISTICS OF RESONATORS WITH ARBITRARY DISTRIBUTION OF DIELECTRIC PERMITTIVITY Abstract only c70
A. S. Logginov and Yu. F. Yulberdin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 51 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 29-34 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04/MF A01

A numerical method was developed for calculating the transverse modes in a semiconductor laser resonator with an arbitrary dielectric permittivity profile. The method is based on the theory of injection lasers and on the corresponding wave equation for the electric field component with complex frequency and wave number. This equation is transformed into a homogeneous system of linear algebraic equations in real and imaginary frequency

increments for a convex transverse inversion profile, normalized to the threshold concentration of injected charge carriers, with a local nonuniformity of the peak or valley kind. The determinant of that system of equations is evaluated by equating both its real and imaginary parts to zero. The corresponding eigenvalue problem is now solved numerically by Newton's iteration method. The results reveal that a local inhomogeneity modifies the spectrum of transverse modes corresponding to the unperturbed inversion profile. R.J.F.

N84-31452# Joint Publications Research Service, Arlington, Va.
ALIGNMENT OF MULTISTATE LASER AMPLIFIERS WITH PERIODIC SPACE FILTRATION OF BEAM Abstract only c36
V. N. Alekseyev, N. V. Nikitin, A. V. Charukhchev, and V. N. Chernov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 55 Transl. into ENGLISH from Optiko-Mekhan. Promyshlennost (Leningrad), no. 11, Nov. 1983 p 46-48 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

Multistage laser amplifiers with periodic space filtration of the beam, used for many applications as diverse as nonliner spectroscopy and X-ray lithography, contain many optical components which must be aligned for optimum or even adequate performance. Except for computer-aided automatic alignment of parallel channels, most alignment is done manually, either directly or from a remote control panel. Alignment is complete when the apertures of all successive optical components have been centered within required accuracy in the direction of the laser beam. For this, along with the beam from the driving pulse source, there is also passed through the amplifier channel a continuous beam from an aligning laser with the same space structure and wavelength. The basic procedure is demonstrated on a single-channel amplifier with a Nd3+ glass laser and several successive stages of planar optics, each preceded by a space filter, with an eyepiece behind the last stage. R.J.F.

N84-31453# Joint Publications Research Service, Arlington, Va.
MODELLING OF TRANSFER PROCESSES IN MONOPOLAR SEMICONDUCTOR STRUCTURES WITH SUBMICRON DIMENSIONS Abstract only c76
A. A. Kokin and V. I. Tolstikhin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 58 Transl. into ENGLISH from Mikroelektron. (Moscow), vol. 13, no. 1, Jan. 1984 p 24-40 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

The increasing complexity of integrated circuits and the reduction of logical elements to 1 micron or less require the modelling of submicron dimension processes. The dimensions are commensurate with the scales determining semiconductor conductivity kinetics leading to special non-local and nonlinear effects and the diffusion-drift Schockley equations are not adequate even for channel lengths of approximately 1 micron and fields of approximately 10,000 V/cm. The modelling of processes limited to n-type monopolar structures with highly mobile links which allow macroscopic description of transfer processes by means of distribution functions are discussed. The method is based upon the Boltzmann kinetic equation with a self-consistent field and an analysis of electron-lattice interaction. A system of differential equations is given with boundaries determined by local equilibrium, effective temperature and quasi-ballistic approximations. Unbalanced scale effects, which are important for integrated circuit semiconductor elements, are analyzed. R.J.F.

N84-31181# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-PRIME PROGRAM SYSTEM
F. T. Rall, Jr. *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 823-841 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003576) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31182# Marconi Avionics Ltd., Rochester (England).
OPTIONS AND OPPORTUNITIES FOR STANDARDS: A NATO/AGARD VIEWPOINT
J. T. Shepherd and L. J. Urban *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 843-859 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003577) Avail: NTIS HC A25/MF A01 CSCL 09/3

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-31454 British Broadcasting Corp., Kingswood (England). Engineering Div.
THE ACOUSTIC DESIGN OF OUTSIDE BROADCAST VEHICLES
E. W. Taylor May 1984 13 p refs
(BBC-RD-1984/3) Avail: BBC, Kingwood Warren, Tadworth, Surrey, England

A review is given of the acoustic design of outside broadcast vehicles in terms of the constraints implicit in the use of road vehicles. A new design of vehicle wall construction is described, the provision of sound absorbing material suitable for use in small enclosures is discussed, and particular factors involved in utilizing large (articulated) vehicles are mentioned. As an illustration, an account is given of the acoustic design of the BBC's Digital Control Vehicle: priority was given, in this vehicle, to the provision of the best possible environment for sound monitoring and control. R.J.F.

N84-31455 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL TRANSMISSION: 68Mbit/s PAL FIELD TRIAL SYSTEM
J. H. Stott Jun. 1984 20 p refs
(BBC-RD-1984/5) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A digital system that carries one high quality video signal and two high quality sound channels within a 68 megabit per sec (mbit/s) package is described. A further 8448 kbit/s capacity is available for telephony or sound channels. Two of the 68 mbit/s packages can be carried by a standard 140 mbit/s digital link. M.A.C.

N84-31456 Illinois Univ., Urbana.
PERFORMANCE OF DIGITAL COMMUNICATIONS OVER SELECTIVE FADING CHANNELS Ph.D. Thesis
Frederick Dwight Garber 1983 155 p
Avail: Univ. Microfilms Order No. DA8409930

The performance of digital communications over selective wide-sense-stationary uncorrelated-scattering (WSSUS) fading channels is investigated. The emphasis is on the evaluation of the performance of binary differential phase-shift keyed (DPSK) and binary frequency-shift keyed (FSK) communications with primary emphasis on the effects of intersymbol interference produced by the frequency-selective character of WSSUS fading channels. The error probabilities of DPSK and FSK are evaluated for several models of WSSUS frequency-selective fading channels. The analysis is focused on the performance evaluation of Rayleigh fading channels. The expressions for the probability of error for these systems are formulated in a way that allows the identification of the key parameters of the communication system. The performance of DPSK and FSK are evaluated for several signaling formats. The design parameters considered are the shapes of the basic data-pulse waveforms for both DPSK and FSK, the modulation index, and the relative phase between successive transmitted signals for FSK. Dissert. Abstr.

N84-31457 California Univ., Los Angeles.
THE APPLICATION OF CONVOLUTIONAL CODES TO CONTINUOUS PHASE MODULATED COMMUNICATION CHANNELS Ph.D. Thesis
Dale Alan Goudey 1983 159 p
Avail: Univ. Microfilms Order No. DA8408807

Convolutional codes are found which are optimal for certain continuous phase modulation (CPM) communication channels. The CPM channel is important due to its bandwidth efficiency. As a consequence of its constant amplitude, the CPM scheme also allows the design of efficient transmitters, as required for satellite communication. The specific CMP channels investigated in detail include binary and quaternary schemes, rectangular and raised cosine pulse shapes with pulse lengths of one and two, and several modulation indexes. The codes investigated include binary rate 1/2, 1/3, and 2/3. The concept of trellis code isomorphism is introduced which greatly reduces the size of the optimal code search problem. In addition, new conventions are introduced which allow a meaningful assessment to be made of the relative merits of coding/modulation schemes with different coding rates and modulation indexes. These are the normalized modulation index and a new form of normalized minimum Euclidean distance.
Dissert. Abstr.

N84-31458 Communications Research Centre, Ottawa (Ontario). Information Technology and Systems Branch.
EXPERIMENTAL EVALUATION OF A HIGH FREQUENCY RADIO DATA TERMINAL IN THE SHIP-SHORE MODE
L. Bode, S. M. Chow, N. Serinken, B. Tepper, and R. Yamanoto 17 Sep. 1984 23 p refs
(CRC-1375) Avail: Issuing Activity

A field trial of a ship/shore direct printing HF radio message transmission system is described. The field trial was conducted between a Canadian Coast Guard ship in the Arctic and a radio station in Ottawa over a six week period. Four hundred and seventy thousand characters were passed with no errors due to the ARQ protocol. The average transmission rate attained was 300 to 500 characters per minute. It is indicated that the ARZ protocol used is both effective and efficient. E.A.K.

N84-31459*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Monthly Progress Report, 14 Mar. - 13 Apr. 1984
20 Apr. 1984 5 p refs
(Contract NAS8-35594)
(NASA-CR-171130; NAS 1.26:171130) Avail: NTIS HC A02/MF A01 CSCL 20N

The effect of gravitational sedimentation on the atmospheric aerosol size distribution has been simulated using a one layer numerical model. A nonlinear curve fitting program is being developed to study aerosol size parameters. The Sage/Sam 2 data establishing the geographical and temporal variations of aerosol concentration in the troposphere are being studied. The basic version of the Sam 2 program and the alternative version of the Sage 2 program are operational. Above 6 km, latitudinal differences are more important in determining aerosol concentration than surface conditions. S.B.

N84-31460*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 20 AND 30 GHz MMIC TECHNOLOGY FOR FUTURE SPACE COMMUNICATION ANTENNA SYSTEM
G. Anzic and D. J. Connolly 25 Oct. 1984 9 p refs Presented at the Gallium Arsenide (GaAs) Integrated Circuits Symp., Boston, 23-25 Oct. 1984; sponsored by IEEE
(NASA-TM-83745; E-2227; NAS 1.15:83745) Avail: NTIS HC A02/MF A01 CSCL 17B

The development of fully monolithic gallium arsenide receive and transmit modules is described. These modules are slated for phased array antenna applications in future 30/20 gigahertz communications satellite systems. Performance goals and various approaches to achieve them are discussed. The latest design and performance results of components, submodules and modules are presented. Author

N84-31461*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MONOLITHIC MICROWAVE INTEGRATED CIRCUITS: INTERCONNECTIONS AND PACKAGING CONSIDERATIONS
K. B. Bhasin, A. N. Downey, G. E. Ponchak, R. R. Romanofsky, G. Anzic, and D. J. Connolly 1984 16 p refs Proposed for presentation at the 4th Ann. Intern. Electron. Packaging Conf., Baltimore, 29-31 Oct. 1984; sponsored by the International Electronics Packaging Society
(NASA-TM-83774; E-2266; NAS 1.15:83774) Avail: NTIS HC A02/MF A01 CSCL 09C

Monolithic microwave integrated circuits (MMIC's) above 18 GHz were developed because of important potential system benefits in cost reliability, reproducibility, and control of circuit parameters. The importance of interconnection and packaging techniques that do not compromise these MMIC virtues is emphasized. Currently available microwave transmission media are evaluated to determine their suitability for MMIC interconnections. An antipodal finline type of microstrip waveguide transition's performance is presented. Packaging requirements for MMIC's are discussed for thermal, mechanical, and electrical parameters for optimum desired performance. E.A.K.

N84-31462*# Harris Corp., Melbourne, Fla. Government Electronic Systems Div.
HOOP/COLUMN ANTENNA RF VERIFICATION MODEL. VOLUME 2: ANALYSIS AND CORRELATION Final Report
W. F. Croswell, ed., M. D. Vanstrum, R. J. Schrimpf, R. C. Taylor, and R. L. Moye Aug. 1984 78 p refs
(Contract NAS1-15763)
(NASA-CR-172413; NAS 1.26:172413) Avail: NTIS HC A05/MF A01 CSCL 20N

As part of the Large Space System Technology Program, the theoretical and experimental results of the RF characteristic of a hoop/column, quad aperture antenna using an RF verification model are presented. To satisfy the primary purposes of the model, experimental pattern data is provided for the quad aperture configuration at different reflector edge illumination levels, from which the geometry and edge effects can be assessed, and experimental data which can be compared with calculations using various theoretical reflector scattering formulae are provided. It also experimentally determines the effects upon secondary patterns of scale model quartz cables, as used in the hoop/column design, upon secondary patterns in order to assess the importance of developing a scattering theory to predict such effects. In addition, a comprehensive theoretical study and the experimental pattern results of quad aperture antenna feeds, a discussion of the fundamental affect of parasitic side lobes, their amplitude, and location in space. Author

N84-31463*# Harris Corp., Melbourne, Fla. Government Electronic Systems Div.
HOOP/COLUMN ANTENNA: RF VERIFICATION MODEL. VOLUME 1: TEST RESULTS Final Report
W. F. Croswell, ed., M. D. Vanstrum, R. J. Schrimpf, R. G. Taylor, and R. L. Moye Hampton, Va. NASA. Langley Research Center Aug. 1984 324 p 2 Vol.
(Contract NAS1-15763)
(NASA-CR-172412; NAS 1.26:172412) Avail: NTIS HC A14/MF A01 CSCL 17B

As part of the Large Space System Technology Program, this report, in two volumes, presents the theoretical and experimental results of the RF characteristic of a hoop/column, quad aperture antenna using an RF verification model. To satisfy the primary purposes of the model it provides experimental pattern data for the quad aperture configuration at different reflector edge illumination levels, from which the geometry and edge effects can be assessed, and provides experimental data which can be compared with calculations using various theoretical reflector scattering

formulae. It also experimentally determines the effects upon secondary patterns of scale model quartz cables, as used in the hoop/column design, upon secondary patterns in order to assess the importance of developing a scattering theory to predict such effects. In addition, this report contains a comprehensive theoretical study and the experimental pattern results of quad aperture antenna feeds, a discussion of the fundamental affect of parasitic side lobes, their amplitude, and location in space. Author

N84-31464*# Chu Associates, Inc., Littleton, Mass.
REFLECTOR ANTENNAS WITH LOW SIDELOBES, LOW CROSS POLARIZATION, AND HIGH APERTURE EFFICIENCY Final Report
I. M. Faigen, C. F. Reichert, C. J. Sletten, and R. A. Shore Mar. 1984 123 p refs Prepared in cooperation with Solar Energy Technology, Inc., Bedford, Mass.
(Contract NAS3-22343)
(NASA-CR-174670; NAS 1.26:174670) Avail: NTIS HC A06/MF A01 CSCL 20N

Techniques are presented for computing the horn near field patterns on the subreflectors and for correcting the phase center errors of the horn pattern by shaping the subreflector surface. The diffraction pattern computations for scanned beams are described. The effects of dish aperture diffraction on pattern bandwidth are investigated. A model antenna consisting of a reflector, shaped subreflector, and corrugated feed horn is described. M.A.C.

N84-31465# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON WAVES IN NONADIABATIC AND NONEQUILIBRIUM GASES
K. Zhi and L. Wen-Qiang 19 Apr. 1984 19 p Transl. into ENGLISH from Li Hsueh Pao (China), v. 32, no. 6, 1983 p 713-722
(AD-A141450; FTD-ID(RS)T-0284-84) Avail: NTIS HC A02/MF A01 CSCL 20/14

The propagation of the waves (including relaxation, pressure, and density waves) and thermal modes in nonadiabatic and nonequilibrium gases are discussed. Based on the mechanism of thermal disturbance feedback, a new governing equation for the propagation of disturbances and the dispersion relation is obtained. Some new conclusions are reached. For example, the disturbance is either purely growing or slowly damped which presents a reasonable explanation for abnormal absorptive phenomena of infrasonic sound waves in atmosphere; nonadiabatic characteristic of gas can cause a remarkable dispersion phenomena; the propagation of noise can be damped, etc. In addition, the conclusion that pressure and density waves and thermal mode may be unstable agrees with the experimental fact about thermal instability in high power laser discharges. R.J.F.

N84-31466# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IONIZING EMISSIONS AND ELECTRONICS
L. G. Shirshev 22 May 1984 329 p Transl. into ENGLISH of mono. "Ioniziruyushchiye Izlucheniya i Elektronika" Moscow, 1969 p 1-191
(AD-A142065; FTD-ID(RS)T-1675-83) Copyright. Avail: NTIS HC A15/MF A01 CSCL 17/2

Ionizing radiation which affects radio electronic equipment is discussed. Radiation damage, charged particle characteristics, and radiation contamination from nuclear explosions are discussed. Radiation from nuclear power plants and spacecraft power units is discussed. R.J.F.

N84-31467# Rome Air Development Center, Griffiss AFB, N.Y.
PROCEEDINGS OF THE ANTENNA APPLICATIONS SYMP., VOLUME 2
Mar. 1984 397 p Symp. held in Urbana, Ill., 21-23 Sep. 1983
(AD-A142754; RADC-TR-84-52-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 09/5

The Proceedings of the 1983 Antenna Applications Symposium are a collection of the State-of-the-Art papers relating to Phased Array Antennas, Millimeter Wave Antennas, Microstrip and Conformal Antennas and Reflector Antennas. For individual titles, see N84-31468 through N84-31485.

N84-31468# Illinois Univ., Chicago.
A COMPARATIVE STUDY OF LINEAR ARRAY SYNTHESIS TECHNIQUE USING A PERSONAL COMPUTER
M. A. Burns, S. R. Laxpati, and J. P. Shelton *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 7-20 (For primary document see N84-31467 21-32)
(AD-P003500) Avail: NTIS HC A17/MF A01 CSCL 09/5

Five computer programs for synthesizing low-sidelobe sum patterns from linear arrays are evaluated in terms of run time and precision. Three of the programs are based on the Dolph-Chebyshev synthesis procedure, in which all sidelobes are set at the same level. The other two programs are based on discretized version of the Taylor synthesis procedure, in which far-out sidelobes are allowed to decay. The programs were written for use on small 8- and 16-bit personal computers. It was found that the fastest running programs are also the most precise. The only Chebyshev program that gave satisfactory precision for arrays as large as 100 elements is based on Bresler's nested product algorithm, and the only similarly acceptable Taylor program is based on Shelton's discretized synthesis. Author (GRA)

N84-31469# Electronics Research Lab., Adelaide (Australia).
THE USE OF OVERLAPPED SUBARRAY TECHNIQUES IN SIMULTANEOUS RECEIVE BEAM LINEAR ARRAYS
L. H. Sinnott and G. R. Haack *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 21-37 (For primary document see N84-31467 21-32)
(AD-P003501) Avail: NTIS HC A17/MF A01 CSCL 09/5

A linear array of antennas connected to an appropriate beam-forming matrix or having outputs processed digitally to yield a spatial Fourier analysis allows great flexibility for multiple-beam reception in a HF radar. However, for large numbers of elements the cost becomes unmanageable. Subarraying the elements reduces the degrees of freedom and hence the cost but introduces difficulties with grating lobe effects. A design approach is developed which uses steerable subarrays whose outputs are used to develop multiple simultaneous beams lying within the envelope of the subarray pattern. The combination of amplitude taper within the subarrays and overlap of the subarrays can be used in a systematic way to realize simultaneous beams having an equiripple sidelobe structure of specified level below the beam maximum. A design process is developed and illustrated by typical applications. Author (GRA)

N84-31470# AEL Industries, Inc., Lansdale, Pa.
COMPUTER ANALYSIS OF PHASED ARRAY FAR-FIELD PATTERNS FOR NON-SYMMETRICAL FEED NETWORKS
K. G. Schroeder *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 38-64 (For primary document see N84-31467 21-32)
(AD-P003502) Avail: NTIS HC A17/MF A01 CSCL 09/5

Increased power in the main lobe of a transmit array (or, conversely, increased signal-to-noise ratio in a receive array) is possible by reducing the energy contained in the sidelobes. While this also reduces the peak gain of the major lobe (main beam), it increases the overall array main beam efficiency, because no energy is lost in directions other than the desired ones. Also, there is a general goal in radar and communications systems to minimize sidelobes for the purpose of minimizing interference and jamming. In order to achieve a low sidelobe structure with minimal feed loss, a number of techniques are available in the microwave region such as the tapered-excitation slot array. GRA

N84-31471# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
ANALYSIS OF DIRECTIVITY AS A FUNCTION OF SCAN ANGLE FOR PLANAR ARRAYS OF RADIATING SLOTS
R. S. Konapelsky, G. A. Peon, and K. G. Ramsey *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 65-87

(For primary document see N84-31467 21-32)
(AD-P003503) Avail: NTIS HC A17/MF A01 CSCL 09/5

Computer-aided determination of phase scanned slot array directivity is obtained via the computation of individual array slot driving point admittances as a function of scan angle or both the E and H-planes of the array. Carter's equation s for mutual coupling and the duality principle are employed to compute mutual couplings among the half wave length radiating slots in the finite ground plane of a plate array. Using the previously computed mutual computing coupling expressions and the complex radiating slot excitations, which vary according to the main beam scan angle, driving point admittances are obtained for any desired array principal plane scan angle. Using the scan angle dependent point admittance values previously determined, the reflection coefficients for each radiating element and subsequently the entire array are computed and used in turn to evaluate numerically, changes in directivity of the array as the main beam is scanning in an E or H principal away from broadside. Author (GRA)

N84-31472# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
CONFORMAL ARRAY ANALYSIS
J. Wojtowicz, K. G. Ramsey, and T. Fontana *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 88-104 (For primary document see N84-31467 21-32)
(AD-P003504) Avail: NTIS HC A17/MF A01 CSCL 09/5

The idea of having conformally mounted phased array antennas has rapidly gained popularity in the past few years. High performance for conformal arrays however is more difficult to achieve than with the more conventional planar arrays. The primary reasons for this are discussed. First, the individual element patterns of the radiators point in different directions, which produces an undesirable amplitude variation as a function of observation angle. Secondly, the path lengths from the radiators avary in a manner which is not harmonic in sin theta, as is true with planar arrays. Thirdly, the formal array has the problem that for certain region of space some of the elements are physically blocked and cannot contribute to the far field pattern. Author (GRA)

N84-31473# Manitoba Univ., Winnipeg. Dept. of Electrical Engineering.
PHASE ERROR EFFECTS ON THE RADIATION PATTERNS OF SPACE-FED PLANAR PHASED ARRAYS
K. S. Rao and L. Shafai *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 105-118 (For primary document see N84-31467 21-32)
(AD-P003505) Avail: NTIS HC A17/MF A01 CSCL 09/5

The effects of the quantization and collimation phase errors on the radiation patterns of planar phased arrays fed optically through radar horns, are discussed in this paper. Based on the results calculated for an array configuration, it has been established that the collimation phase error can be utilized in reducing the array sidelobe levels. Author (GRA)

N84-31474# Ball Aerospace Systems Div., Boulder, Colo.
BROADBAND MICROSTRIP MATCHING TECHNIQUES **c33**
D. A. Paschen *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 119-138 (For primary document see N84-31467 21-32)
(AD-P003506) Avail: NTIS HC A17/MF A01 CSCL 09/5

Microstrip antennas are used in many applications where a low-profile conformal antenna is desired. They are rugged, lightweight, and easily fabricated. However, it is desirable to increase the bandwidth of these antennas. Through the use of proper matching techniques, standard microstrip antennas can be matched to bandwidths of 35% or more. A rectangular half-wave microstrip radiator was built and tested with and without broadbanding to show the capabilities of these matching techniques. Author (GRA)

N84-31475# Raytheon Co., Bedford, Mass. Missile Systems Div.
WIDEBAND MICROSTRIP RING RADIATOR **c33**
M. L. Lewis and J. F. Toth *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 139-160 (For primary document see N84-31467 21-32)
(AD-P003507) Avail: NTIS HC A17/MF A01 CSCL 09/5

A description is given of a wideband mircostrip antenna element suitable for use in an array. Several configuration which operate over a relatively wide band of frequencies (> 10%) are identified. The theory of operation, an analytical model, and experimental data for the antenna element are also described. Author (GRA)

N84-31476# Boeing Aerospace Co., Seattle, Wash.
BROADBAND CAVITY-BACKED SLOT USING PRINTED CIRCUIT TECHNOLOGY **c33**
W. A. Schneider, G. E. Miller, and R. J. Coe *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 161-177 (For primary document see N84-31467 21-32)
(AD-P003508) Avail: NTIS HC A17/MF A01 CSCL 09/5

Some advantages of printed circuit antenna designs are low fabrication cost, conformability, tolerance control, and improved reproducibility. The microstrip patch radiator is one of the more popular printed circuit elements used in applications not requiring large bandwidth. Many classical antenna elements may, however, be manufactured using printed circuit techniques giving the antenna designer several options to best satisfy electrical design goals while retaining the advantages of printed circuit manufacturing. A printed circuit cavity backed slot radiator suitable for airborne-phased array applications is described in this paper. It has approximately twice the bandwidth of a microstrip patch having the same thickness. GRA

N84-31477# Ball Aerospace Systems Div., Boulder, Colo.
A CONFORMAL SHF PHASED ARRAY FOR AIRCRAFT SATELLITE COMMUNICATION
R. Cummings and K. Kudrna *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 179-192 (For primary document see N84-31467 21-32)
(AD-P003509) Avail: NTIS HC A17/MF A01 CSCL 09/5

A receive-only 7.5 GHz microstrip phased array has been developed by Ball Aerospace Systems Division (BASD). This 256 radiating element array provides a gain of 20 dBic over a conical scan region of 120 deg. Two arrays with one on either side of an aircraft would provide near hemispherical coverage. The array consists of four subarrays and can be expanded to achieve higher gain when required. The array is left-hand circularly polarized and has three-bit digital PIN diode phase shifters for steering the beam. A microprocessor-based beam steering controller is used for calculating the phase shifter settings for each beam position. Each subarray includes radiating elements, quadrature hybrids, phase shifters, corporate feed, R.F. chokes in microstrip medium and hybrid PIN diode drivers. The array is approximately 1.5 inches thick and is conformal to the aircraft skin. It is a bolt on assembly only requiring aircraft skin entries for the R.F. output and for control lines. Transmit capability can be provided by merely changing the artwork to go to 8.5 GHz. Author (GRA)

N84-31478# Manitoba Univ., Winnipeg. Dept. of Electrical Engineering.
ON THE QUASI-PERIODIC MICROSTRIP SNAKE ANTENNA WITH METAL TROUGH BACKING
O. Aboul-Atta and L. Shafai *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 193-208 (For primary document see N84-31467 21-32)
(AD-P003510) Avail: NTIS HC A17/MF A01 CSCL 09/5

This study tackles the radiation mechanism of a microstrip with a quasi-periodic undulation supported inside a metal trough of a rectangular cross section that acts as a choke on the closed side and provides the radiating aperture on the other. The strip is excited in a travelling wave mode in the neighborhood of a central frequency that corresponds to a 2 pi-phase shift per travelling a Meander period. Hence, the transverse current components to the axial length enhance each other coherently so as to constitute

the main source of excitation to the radiating aperture.
Author (GRA)

N84-31479# Mitre Corp., McLean, Va.
MOEBIUS R-2R LENS
R. E. Clapp *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 209-238 (For primary document see N84-31467 21-32)
(AD-P003511) Avail: NTIS HC A17/MF A01 CSCL 09/5

A novel multibeam antenna concept is described. This antenna concept is a generalization of the R-2R lens to permit a full circle of simultaneous beams from a circular or cylindrical antenna array. The angular doubling which characterizes the R-2R geometry, and which ordinarily restricts its applicability to a limited angular sector, is accommodated through the mapping of a full circle of array elements onto two full circuits of the lens structure. In this mapping, the perfect phase focusing of the R-2R geometry is maintained. Recent progress on practical design problems is presented. Author (GRA)

N84-31480# GTE Communications Products Corp., Needham Heights, Mass. Communication Systems Div.
RF DESIGN AND PERFORMANCE OF A MULTIBEAM, MULTIBAND ANTENNA
L. Blaisdell, S. Carrillo, and H. Gelman *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 239-263 (For primary document see N84-31467 21-32)
(Grant DAAB07-79-G-6231)
(AD-P003512) Avail: NTIS HC A17/MF A01 CSCL 09/5

This paper presents results of a Multibeam Antenna Design Study performed for the US Army Satellite Communications Agency, Fort Monmouth, New Jersey, under Contract No. DAAB07-79-G-6231. The RF design and performance of a multibeam, multiband offset parabolic torus antenna for satellite communications Earth terminal applications are described. Author (GRA)

N84-31481# Rome Air Development Center, Griffiss AFB, N.Y. Electromagnetic Sciences Div.
FEED ERROR EFFECTS ON LENS PERFORMANCE
R. L. Haupt and D. J. Jacavanco *In its* Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 264-284 (For primary document see N84-31467 21-32)
(AD-P003513) Avail: NTIS HC A17/MF A01 CSCL 09/5

In order to determine the mechanical alignment requirements for the feed assembly for a large space fed microwave lens, an analysis was performed that predicts the effect of feed errors upon lens performance. The antenna model that was analyzed consists of a small linear array for the feed and a large linear array for the lens. Effects of both transverse and longitudinal feed displacement, tilt, and phase error upon lens RF performance are examined. Results show that sensitivity of antenna gain and sidelobe level to phase and amplitude errors in the lens illumination due to feed position error. Low sidelobe antennas are shown to be particularly sensitive to these errors. The results of this error study suggest the need for active feed and lens correction techniques for low sidelobe space fed lens antennas. Preliminary results of phase-only and phase-amplitude correction applied at the lens and at the feed and lens are given. Author (GRA)

N84-31482# Scientific-Atlanta, Inc., Atlanta, Ga.
A DUAL-PORTED, DUAL-POLARIZED SPHERICAL NEAR-FIELD PROBE
J. R. Jones and D. P. Hardin *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 285-299 (For primary document see N84-31467 21-32)
(AD-P003514) Avail: NTIS HC A17/MF A01 CSCL 14/2

The spherical near-field measurement technique is a convenient and economical method for testing antennas. It is particularly useful for electrically small antennas at low frequencies. It requires much less real estate than conventional far-field ranges and yields more accurate results in a more controlled and secure environment. The spherical near-field measurement technique can be used to test antennas too large in physical size for the compact range technique and, unlike other near-field measurement techniques, it permits the use of standard spherical coordinate positioners. The most serious disadvantage of spherical near-field testing is the time required to perform a test. GRA

N84-31483# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
MULTIPLE SOURCE DF (DIRECTION FINDING) SIGNAL PROCESSING: AN EXPERIMENTAL SYSTEM
R. Schmidt and R. Franks *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 301-330 (For primary document see N84-31467 21-32)
(AD-P003515) Avail: NTIS HC A17/MF A01 CSCL 17/3

The MUltiple Signal Characterization (MUSIC) algorithm is an implementation of the Signal Subspace Approach to provide parameter estimates of multiple signals from the observed voltages received on an array of M antennas. In it, the solution of the multiple source DF problem is the intersection of the signal subspace (obtained from the received data) and the array manifold (obtained via array calibration). The MUSIC algorithm has been implemented to conduct experimental demonstrations of the DF and COPY performance of the approach under scenarios and conditions generally regarded as difficult to impossible in traditional systems. The demonstration system consists of an eight-element antenna array, an eight-channel receiver and digitizer, and a minicomputer with disk storage to process the digitized data. GRA

N84-31484# Raytheon Co., Wayland, Mass. Microwave/Antenna Dept.
ANTENNA PATTERN CHARACTERISTICS OF FINE-STEERED PENCIL BEAMS
C. F. Winter *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 331-362 (For primary document see N84-31467 21-32)
(AD-P003516) Avail: NTIS HC A17/MF A01 CSCL 20/14

When a set of simultaneous pencil beams is available from a multiple beam forming network exciting a linear array, it is possible to fine steer a single beam to any far-field angle within the field of view by approximately combining the signals of selected network beam ports. This paper considers the problem of determining the beam port combining weights required to point a resultant beam at a preselected far-field angle with some measure of control on its aperture efficiency and its highest sidelobe level. A set of orthogonal, in-phase, uniformly excited pencil beams (as might be obtained by feeding a linear array through a Butler matrix) is discussed in detail. In particular, examples of combining three and four adjacent beams are shown where the combining weights are adjusted to provide a resultant beam at a specified angle located between the pointing directions of two linear orthogonal beams and such that this resultant beam has a specified aperture efficiency and a controlled sidelobe level for one chosen near-in sidelobe. GRA

N84-31485# California Inst. of Tech., Pasadena.
SYNTHESIS OF OFFSET DUAL SHAPED SUBREFLECTOR ANTENNAS FOR CONTROL OF CASSEGRAIN APERTURE DISTRIBUTIONS
V. Galindo-Israel and R. Mittra (Illinois Univ., Urbana) *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 363-394 (For primary document see N84-31467 21-32)
(AD-P003517) Avail: NTIS HC A17/MF A01 CSCL 09/5

Many existing large ground reflector antennas have been designed as Cassegrain systems - i.e., paraboloid/hyperboloid-combinations. Other large ground antennas are simply paraboloid designs. Upgrading the gain of these systems to a gain comparable to that obtainable with a daul shaped reflector antenna system has been an important and costly objective of many such ground stations. A potentially economic method for such an antenna upgrade is presented herein. It involves a redesign of only the subreflector portion of a Cassegrain antenna or the introduction of a subreflector feed system for a paraboloid. A pair of offset subreflectors are synthesized which will give a controllable high

gain amplitude distribution in the aperture of the large paraboloid. GRA

N84-31486# Stanford Univ., Calif. Information Systems Lab.
DETERMINING THE NUMBER OF SIGNALS BY INFORMATION THEORETIC CRITERIA
M. Wax and T. Kailath 11 Nov. 1983 5 p Presented at the ICASSP Spectrum Estimation Workshop 2, Tampa, Fla., 10-11 Nov. 1983
(Contracts DAAG29-81-K-0057; DAAG29-79-C-0215; Grant AF-AFOSR-0228-83)
(AD-A142748; AFOSR-84-0515TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

The determination of the number of signals in a wide class of problems, including array processing, harmonic retrieval and pole retrieval, is addressed. A new approach, based on the application of the information theoretic criteria for model identification introduced by Akaike, Schwartz and Rissanen, is presented. It is shown that the criterion introduced by Schwartz and Rissanen yields a consistent estimate of the number of signals, while the criterion introduced by Akaike yields an consistent estimate that tends, in the large sample limit, to overestimate the number of signals. Author (GRA)

N84-31487# Hazeltine Corp., Greenlawn, N. Y.
AXIAL-CONDUCTANCES ANGULAR FILTER INVESTIGATION Final Technical Report, Apr. 1981 - Sep. 1983
P. W. Hannan and J. F. Pedersen Apr. 1984 239 p
(Contract F19628-81-C-0067)
(AD-A142802; Rept-6519; RADC-TR-84-80) Avail: NTIS HC A11/MF A01 CSCL 09/5

This report describes the concept, analysis, design, construction, and tests of an angular filter using an axial-conductance medium. The filter provides rejection that increases with incidence angle in the E plane. It is essentially invisible at broadside incidence, does not have critical tolerances on dimensions or materials, and operates over a wide frequency band. Analysis of an ideal homogeneous axial-conductance medium shows that the optimum value for the axial loss tangent is unity. With this value, the homogeneous medium provides approximately 8 dB of absorptive rejection per wavelength of filter thickness at a 45 E-plane incidence angle. Analysis of a practical inhomogeneous axial-conductance medium shows that some loss is introduced at broadside incidence, and that two types of waves can exist in the medium when only one wave is incident at an oblique angle. When the practical medium has dimensions that are properly chosen, its broadside loss can be negligible, and its rejection versus incidence angle can approximate that of the ideal medium. Tests of inhomogeneous samples in simulator wave guide confirm these analytical results. A screen printing method for depositing thick-film resistive ink on thin dielectric sheets has been investigated. With this method a 5x5 foot angular filter, designed for operation at 10 GHz, has been constructed containing over 70,000 axial-conductance elements. GRA

N84-31488# YLYK Ltd., Ann Arbor, Mich.
HIGH SPEED LOW-COST WAYS TO GET MESSAGES FROM A SENDER TO A RECEIVER WHEN SOME CHANNELS LINKING THEM BECOME INOPERATIVE Final Report, 30 Sep. 1983 - 31 Mar. 1984
B. Blakley 28 May 1984 153 p
(Contract F49620-83-C-0160)
(AD-A142831; YLYK/AFOSR/SBIRI/83-84/001; AFOSR-84-0528TR) Avail: NTIS HC A08/MF A01 CSCL 17/2

This AFOSR SBIR Phase I Project produced explicitly the hyperfast pool/split/restitute algorithms of the Bloom technique. These algorithms, once they obtain hardware implementation, will be used as follows. They will make it possible for a sender to get all desired digital information to a receiver by coding it for transmission over several parallel channels in such a way that decoding will recover everything sent even when up to a predetermined number of channels fail. This project developed a set of design principles for hardware implementation of such p/s/r processes by means of existing microprocessors of sizes 4, 8 and 16 bits. Author (GRA)

N84-31489# Messina Univ. (Italy). Ist. di Structura della Materia.
SCATTERING PROPERTIES OF A MOVING DIELECTRIC OBJECT Periodic Report, Jan. - Jun. 1984
R. Saija Jun. 1984 38 p
(Contracts DAJA45-84-C-0005; DAJA37-81-C-0895; DA Proj. 1T1-61102-BH-57)
(AD-A142845; Periodic-2) Avail: NTIS HC A03/MF A01 CSCL 20/6

The absorption coefficient for the propagation of the electromagnetic field through a low-density dispersion of nonspherical scatters of random orientation was calculated by modelling them as clusters of spheres. The spheres are then allowed to rearrange among the clusters to simulate chemical reactions and the changes induced on the absorption coefficient of the dispersion are discussed in a few significant cases. Author (GRA)

N84-31490# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
THE APL RCS (RADAR CROSS SECTION)/STATISTICS CODE DESCRIPTION, ILLUSTRATIONS OF OUTPUT, AND USER'S GUIDE
F. C. Paddison, A. L. Maffett, J. W. Follin, and H. W. Klimach Jan. 1984 78 p
(Contract N00024-83-C-5301)
(AD-A142929; JHU/APL/TG-1345) Avail: NTIS HC A05/MF A01 CSCL 09/2

The report is a description of a computer code that results in the first- and higher-order statistics of radar cross sections (RCS) of a complex target as a function of frequency polarization, aspect angle, and constituent parameters of the target. The promise is that a complex target can be represented by a set of simple scatterers. There is a general discussion of RCS data; the capabilities of the code from the viewpoint of the RCS analyst or data librarian; the theory of RCS, statistics, lobe structure, and glint embodied in the code; a user's guide from the viewpoint of the computer analyst; and a program listing. GRA

N84-31491# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
COMPUTER PROGRAMS FOR ELECTROMAGNETIC COUPLING BETWEEN A CONDUCTING BODY AND AN APERTURE IN AN INFINITE CONDUCTING PLANE
S. W. Hsi and R. F. Harrington Mar. 1984 47 p
(Contract N00014-76-C-0225)
(AD-A142975; SYRU/DECE/TR-84/4) Avail: NTIS HC A03/MF A01 CSCL 09/2

Computer programs for the analysis of electromagnetic coupling between a thin straight conducting wire and an aperture in an infinite conducting plane are briefly described and listed in this report. The aperture is of arbitrary shape and size. The wire is of finite length (with or without loads) or of infinite length. The excitation is either a plane wave incident from the opposite side of the wire or TEM voltages applied on the wire. The current distributions in the aperture and on the wire are computed. In addition, for the case of TEM voltage excitation, the power transmitted through the aperture is computed. For the case of plane wave excitation, this document evaluates an equivalent circuit of the aperture for the transmission line mode on an infinitely long wire or an arbitrarily loaded wire. GRA

N84-31492# Human Resources Research Organization, Alexandria, Va.
DEVELOPMENT OF A COMPUTER-ASSISTED SIMULATION OF TACTICAL VOICE COMMUNICATIONS. PHASE 1: CONCEPTUAL DESIGN Final Report, Sep. 1982 - Dec. 1983
D. L. Hannaman, P. R. Michaelis (Texas Instruments, Inc., Dallas), and R. M. Chambers (Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.) Dec. 1983 90 p
(Contract MDA903-82-C-0511; DA Proj. 2Q1-62717-A-790)

(AD-A143036; HUMRRO-FR-TRD(VA)-83-7) Avail: NTIS HC A05/MF A01 CSCL 17/2

The dramatic introduction of technology onto the battlefield has intensified in recent years and is expected to continue at an accelerated rate. This results in increased human performance demands. Human performance is physiologically limited in terms of the rate at which a human can process information and physically perform tasks. Though there is little that can be done about the human's physiological limitations, human performance capabilities can be improved in other ways. Human performance capabilities of Army personnel can best be improved by either raising enlistment standards (e.g., education, aptitude) and/or providing more and better training. Enlistment standards are expected to remain relatively constant during the foreseeable future. Though Army training has improved and will continue to do so, the training environment is burdened with ever increasing demands (to a large extent attributable to the proliferation of technology on the battlefield) while simultaneously experiencing diminishing resources (e.g., time and money). As a result, human performance capabilities in the Army are also expected to remain relatively constant. GRA

N84-31493# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.

SOLUTION OF SOME ADDITIONAL ELECTROMAGNETIC PROBLEMS BY THE DISCRETE CONVOLUTION METHOD

H. L. Nyo and R. F. Harrington Feb. 1984 79 p

(Contract N00014-76-C-0225)

(AD-A143056; SYRU/DECE/TR-84/3; TR-23) Avail: NTIS HC A05/MF A01 CSCL 09/5

This report gives solution results and computer programs for the Discrete Convolution method applied to scattering from a helix, to radiation from planar array antennas with antenna elements arranged in triangular patterns (solved using one expansion function per element), and to radiation from planar array antenna with antenna elements arranged in triangular patterns (solved using three expansion functions per element). It also gives a brief discussion on the spatial domain interpretation of the spectral domain iteration technique. Author (GRA)

N84-31494# Naval Postgraduate School, Monterey, Calif.

ANALYSIS OF MODERN ANALOG AND DIGITAL COMMUNICATION CHANNELS FROM A MANAGER'S PERSPECTIVE M.S. Thesis

J. A. Brouse, Jr. Mar. 1984 184 p

(AD-A143161) Avail: NTIS HC A09/MF A01 CSCL 17/2

This thesis presents the fundamental communication transmission principles which define the performance characteristics of the transmission channel. The subject matter is divided into three categories (1) antennas, (2) transmission lines, and (3)waveguides. The scope of the presentation is results oriented rather than the traditional theorem and proof approach. While the results are quantitative in nature, consideration of the underlying principles as well as the advantages and disadvantages associated with each transmission channel are presented. Although technical factors are often the basis upon which decisions regarding communication systems are made, it is evident that the telecommunication systems manager must understand the fundamental principles of the transmission channel in order to effect viable solutions to telecommunications management problems.

Author (GRA)

N84-31495# Department of the Army, Washington, D. C.

VOICE INTEGRATED PRESENTATION SYSTEM Patent Application

N. S. Dumas, inventor (to Army) Filed 26 Jun. 1984 68 p

(AD-D011076; US-Patent-Appl-SN-598751) Avail: NTIS HC A04/MF A01 CSCL 17/2

An audiographic telephone conferencing system between a plurality of parties or users either directly connected or through a piece of apparatus known as a meet me bridge over voice grade telephone lines. Each user has a programmed personal computer which controls a programmable or smart modem, cassette recorder/player, and speakerphone. A protocol is implemented by the software, i.e., the computer program, in each of the computers which puts its respective modem in a listening mode to monitor the phone line at all times. The computer is further programmed and includes a memory for storing and transmitting graphics presently on hand to other user(s) via the modem during a teleconference or alternatively receive graphics from another user, or it can switch to an external graphics program to make new or modify existing graphic images. However, one is unable to speak on the telephone line while a graphic is being transmitted during a teleconference due to the fact that voice alternates with graphic transmissions. Author (GRA)

N84-31496# California Univ., Livermore. Lawrence Livermore Lab.

DYNAMIC CHARACTERISTIC OF INTENSE SHORT MICROWAVE PROPAGATION IN AN ATMOSPHERE

J. H. Yee, R. A. Alvarez, D. J. Mayhall, D. J. Madsen, and H. S. Cabayan Jul. 1983 26 p refs Presented at 2nd Natl. Conf. on High Power Microwave Technol., Adelphi, Md., 1 Mar. 1983

(Contract W-7405-eng-48)

(DE84-002788; UCRL-88711; CONF-830314-7) Avail: NTIS HC A03/MF A01

The dynamic behavior of an intense microwave pulse which propagates through the atmosphere was investigated. Maxwell's equations were solved together with the electron fluid equations. It is shown a significant amount of energy can reach the Earth's surface. The amount of energy that reaches the Earth's surface as a function of initial energy and wave shape after having propagated through 100 km in the atmosphere are investigated. Results for the air breakdown threshold intensity as a function of the pressure for different pulse widths and different frequencies is also presented. The theoretical and the experimental results for the pulse shape of a short microwave pulse after it has traveled through a rectangular wave guide which contains a section of air are compared. DOE

N84-31497# Los Alamos Scientific Lab., N. Mex.

LUMPED-CIRCUIT MODEL OF FOUR VANE RFQ RESONATOR

Thomas P. Wangler 1984 4 p refs Presented at Linear Accelerator Conf., Darmstadt, West Germany, 7-11 May 1984

(Contract W-7405-eng-36)

(DE84-011343; LA-UR-84-1342; CONF-840529-24) Avail: NTIS HC A02/MF A01

The RF cavity code SUPERFISH is a necessary tool in designing RF cavities and it is often used it for approximate analytic formulas of electromagnetic properties of a cavity. One approach for the RFQ four vane cavity is the use of analytic solutions associated with an inclined plane waveguide. The large capacity vane loading in the four vane RFQ resonator give a convenient representation by a simple lumped circuit model. Formulas are derived which depend on a single unknown parameter: the vane capacitance per unit length, which can be calculated for different vane geometries using SUPERFISH. The formulas from the model are useful for estimating the RFQ's electromagnetic properties. DOE

N84-31498# Los Alamos Scientific Lab., N. Mex.

OPERATIONAL PARAMETERS OF A 2.0-MeV RFQ LINAC

O. R. Sander, F. O. Purser, and D. P. Rusthoi 7 May 1984 3 p refs Presented at the Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7-11 May 1984

(Contract W-7405-eng-36)

(DE84-011368; LA-UR-84-1277; CONF-840529-19) Avail: NTIS HC A02/MF A01

After extensive upgrading, the radio frequency quadrupole (RFQ) linac is again installed on the accelerator test stand (ATS). The measured parameters of the RFQ, such as the output transverse emittance, transmitted beam, average energy, and energy spread is presented. DOE

N84-31499# Los Alamos Scientific Lab., N. Mex.

RFQ SIMULATION CODE

W. P. Lysenko Apr. 1984 4 p refs Presented at Linear Accelerator

Conf., Darmstadt-Seeheim, West Germany, 7 May 1984
(Contract W-7405-eng-36)
(DE84-011385; LA-UR-84-1343; CONF-840529-17) Avail: NTIS HC A02/MF A01

The RFQLIB simulation system is developed to provide a means to systematically generate the new versions of radio frequency quadrupole (RFQ) linac simulation codes. This integrated system simplifies keeping track of the various versions of the simulation code and makes it practical to maintain complete and up to date documentation. There is a certain standard version of the simulation code that forms a library upon which new versions are built. To generate a new version of the simulation code, the routines to be modified or added are appended to a standard command file, which contains the commands to compile the new routines and link them to the routines in the library. Whenever the library is modified, this modification is seen by all versions of he simulation code, which actually exist as different versions of the command life. Modularity is enforced by not using COMMON statements, simplifying the relation of the data flow to a hierarchy diagram.
DOE

N84-31500# California Univ., Livermore. Lawrence Livermore Lab.
THE BEHAVIOR OF VERY LARGE SHORT PULSE ANTENNAS
H. M. Buettner and A. J. Spero May 1984 54 p refs
(Contract W-7405-eng-48)
(DE84-012372; UCID-20080) Avail: NTIS HC A04/MF A01

The electromagnetic behavior of a pulsed array of radiating elements exhibit marked differences from standard continuous wave (CW) behavior when the physical size of the array, D, exceeds the physical pulse length, cT (speed of light times pulse duration). Herein a simple analytical model and the results of compute code calculations which explain and illustrate those differences are presented. The behavior of these very large transient antennas (VLTA) is elaborated by using computer codes to illustrate the effects on the radiation pattern when the radiators exhibit randomness of turn-on time or phase.
DOE

N84-31501# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
COMPARISON OF SIMULATION AND MEASUREMENT TECHNIQUES FOR CONTINUOUS WAVES AND PULSES [COMPARISON DES TECHNIQUES DE SIMULATION ET DE MESURE EN ONDES ENTRETENUES ET EN IMPULSIONS]
M. Crochet 1984 7 p refs In FRENCH Presented at 2nd Colloq. Natl. sur la Comptabilite Electromag., Tregastel, France, 1-3 Jun. 1983
(SNIAS-841-422-103) Avail: NTIS HC A02/MF A01

Time and frequency domain methods for determining the transfer characteristics of electronic systems are compared. Frequency domain methods cover a wide frequency range, with good dynamics, but later processing is difficult. Time domain measures are limited dynamically and in band width by noise and sampling technology, but can undergo complex analyses. Frequency methods are recommended for systematic sampling, time domain for modeling.
Author (ESA)

N84-31502# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
A TECHNIQUE FOR SIMULATING CONDUCTION INTERFERENCE CREATED BY ELECTROMAGNETIC PULSES (EMP) [TECHNIQUE DE SIMULATION DE PARASITES DE CONDUCTION CREES PAR L'IEM]
J. M. Peneau and J. M. Sagot 1984 5 p In FRENCH
(SNIAS-841-422-104) Avail: NTIS HC A02/MF A01

A connection cable which can inject calibrated interference into the inputs or outputs of electronic equipment to test perturbation due to EMP was built. The interference is injected into all the wires of a bundle simultaneously. Level can be derived from the screening current.
Author (ESA)

N84-31503# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
CALCULATION OF LOW ALTITUDE ELECTROMAGNETIC PULSES IN THE FIRST MOMENTS [CALCUL DE L'IEM BASSE ALTITUDE AUX PREMIERS INSTANTS]
C. Carel 1984 5 p refs In FRENCH
(SNIAS-841-422-105) Avail: NTIS HC A02/MF A01

A one dimensional finite element program to calculate low altitude electromagnetic pulses in the source zone during the first moments was developed. Coupling between fields and Compton currents is handled by following over time the movement of Compton electron injected at regular intervals as a function of field intensity. The program is most useful for phenomena near the air-ground interface, but its theoretical simplicity is offset by its numerical difficulty. Given the large number of electrons to be treated, a tradeoff between accuracy and computer time is required.
Author (ESA)

N84-31504# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
CALCULATION OF HIGH ALTITUDE ELECTROMAGNETIC PULSES DUE TO X AND GAMMA PHOTONS [CALCUL DE L'IEM HAUTE ALTITUDE DUE AUX PHOTONS X ET GAMMA]
C. Carel 1984 6 p refs In FRENCH
(SNIAS-841-422-106) Avail: NTIS HC A02/MF A01

Finite difference calculations of electromagnetic pulses engendered by X and gamma photon emission at high altitude following a nuclear explosion are discussed. Results show that in the X photon absorption zone gamma photon fields are highly attenuated and are replaced by fields due to X photons shortly after their arrival. For lower altitudes, only the field due to gamma photons is observed. The evolution of the pulses in the first layers of the ionosphere is outlined.
Author (ESA)

N84-31505# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
COUPLING OF ELECTROMAGNETIC PULSES CREATED BY A NUCLEAR EXPLOSION ON THE GROUND WITH OVERHEAD POWER CABLES [COUPLAGES DES CHAMPS ELECTROMAGNETIQUES INDUITS PAR UNE EXPLOSION NUCLEAIRE AU SOL AVEC DES LIGNES AERIENNES]
R. Clerc 1984 7 p refs In FRENCH
(SNIAS-841-422-107) Avail: NTIS HC A02/MF A01

Finite difference, frequency, and circuit simulation methods were used to study the effects of low altitude nuclear explosions on overhead electric power lines. Temporal evolution of currents in protection devices and energy dissipated in the varistors are compared for the three methods. Good agreement is obtained, especially for temporal evolution for times $>$ 1 msec. Instability appears in the current curves around 4 msec due to the sudden drop in the bipolar field. Interference increases relatively slowly (100's of msec) since the highly conductive plasma between the ground and the cables provokes returns to the ground.
Author (ESA)

N84-31506# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
CALCULATION OF ELECTROMAGNETIC FIELDS ON THE SURFACE OF AND INSIDE CAVITIES [CALCUL DES CHAMPS ELECTROMAGNETIQUES SUR LA SURFACE ET A L'INTERIEUR DE CAVITES]
G. Donnet (C.R.2.A, Nanterre, France) and Y. LeGuillou 1984 7 p refs In FRENCH
(SNIAS-841-422-108) Avail: NTIS HC A02/MF A01

Numerical aspects of time and frequency domain integral equations for analyzing currents and electromagnetic fields in and on cavities following a nuclear explosion are discussed. Time and frequency approaches to closed and open metallic structures are compared.
Author (ESA)

N84-31507# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
CALCULATION OF CURRENTS INDUCED IN A NETWORK OF OVERHEAD POWER LINES BY AN ELECTROMAGNETIC IMPULSE [CALCULATION DES COURANTS INDUITS PAR UNE

IEM DANS UN RESEAU DE CABLES AERIENS]
J. L. Roumiguieres (Mothesim) and R. Clerc 1984 6 p refs In FRENCH
(SNIAS-841-422-109) Avail: NTIS HC A02/MF A01

Currents induced by an electromagnetic pulse in overhead power lines are calculated by a method that combines the method of moments, analytical formulations, and transmission line theory. It reduces computer memory and time needed compared with the method of moments, while retaining numerical accuracy. It can treat structures of any dimension over a wide spectrum.
Author (ESA)

N84-31508# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
TEST MEANS AND METHODS LINKED TO EXPERIMENTS ON SYSTEMS [METHODES ET MOYENS D'ESSAIS LIES A L'EXPERIMENTATION D'UN SYSTEME]
C. Rodiere 1984 5 p refs In FRENCH Presented at 2nd Colloq. Natl. sur la Comptabilite Electromag., Tregastel, France, 1-3 Jun. 1983
(SNIAS-841-422-110) Avail: NTIS HC A02/MF A01

Systems analysis logic is recalled and electromagnetic test methods, especially for studying electromagnetic pulses, are summarized. Sine and pulse tests for conduction and radiation are mentioned.
Author (ESA)

N84-31428# Joint Publications Research Service, Arlington, Va.
RESULTS OF INVESTIGATION OF ADAPTIVE SPEECH CODES Abstract only
A. L. Nekhayev, V. A. Pertseva, and I. V. Sitnyakovskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 1 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 37-39 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31429# Joint Publications Research Service, Arlington, Va.
USE OF SPACE-DIVERSE PHOTORECEIVERS FOR ANALYSIS OF INTERFERENCE PATTERNS Abstract only
G. V. Merkishin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 2 Transl. into ENGLISH from Optiko-Mekhan. Promyshennost (Leningrad), no. 11, Nov. 1983 p 13-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31430# Joint Publications Research Service, Arlington, Va.
ADAPTIVE MULTIBEAM ANTENNA ARRAY Abstract only
V. I. Novikov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) Jan. 1984 p 3 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelectron. (Kiev), v. 27, no. 1 p 39-44 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31431# Joint Publications Research Service, Arlington, Va.
TELEVISION TRANSMITTING ANTENNA OF DECIMETER BAND SYSTEM BASED ON TUBES 720 AND 1020 mm IN DIAMETER Abstract only
I. Bradach *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 4 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 29-33 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31432# Joint Publications Research Service, Arlington, Va.
ADAPTIVE ANTENNAS FOR TROPOSPHERIC RADIO RELAY LINES Abstract only
O. P. Frolov *In its* USSR Rept.: Electron and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 4 Transl. into ENGLISH from Electrosvyaz (Moscow), no. 1, Jan. 1984 p 40-42 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31433# Joint Publications Research Service, Arlington, Va.
DESIGN OF SHORT-WAVE ABSORPTION LINES Abstract only
Ya. S. Glazman, R. V. Gurevich, and Ye. R. Gurevich *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 5 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 43-46 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31434# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF NOISE TEMPERATURE OF OPTICAL WAVEGUIDE Abstract only
A. M. Somov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 5 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 46-50 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-32246# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.
SYNTHETIC APERTURE RADAR SIMULATION
N. Szabo *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 205-210 (For primary document see N84-32223 21-81)
(AD-P003474) Avail: NTIS HC A17/MF A01 CSCL 17/9

N84-32049# Joint Publications Research Service, Arlington, Va.
NONLINEAR SCATTERING OF RADIO WAVES BY METAL OBJECTS Abstract Only
V. B. Shteynshleyger *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 17-18 Transl. into ENGLISH from Uspekhi Fiz. Nauk (Moscow), v. 142, no. 1, Jan. 1984 p 131-145 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32053# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF BRAGG REFLECTION OF ELECTROMAGNETIC SURFACE WAVES BY DIFFRACTION GRATING Abstract Only
K. O. Boltar, G. N. Zhizhin, A. A. Sigarev, R. A. Suris, and V. A. Fedirko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 43 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 24, 26 Dec. 1983 p 1502-1506 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32082# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EXCITATION OF SOUND IN METALS Abstract Only
A. N. Vasilyev and Yu. P. Gaydukov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 2-3 Transl. into ENGLISH from Uspekhi Fiz. Nauk (Moscow), v. 141, no. 3, Nov. 1983 p 431-467 (For primary document see N84-32061 21-70)
Avail: NTIS HC A06/MF A01

N84-32086# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF STATISTICAL CHARACTERISTICS OF RANDOM SIGNALS IN NONLINEAR MEDIUM Abstract Only
A. S. Gorshkov, L. G. Lyashedko, and I. T. Trofimenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 21 Transl. into ENGLISH from Vestn. Mosk. Univ.: Ser. 3 Fiz. Astronomiya (Moscow), v. 25, no. 1, Jan. - Feb. 1984 p 103-105 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32101# Joint Publications Research Service, Arlington, Va.
USING INFORMATION ON TANGENTIAL TARGET MOTION IN SPACE-TIME SIGNAL PROCESSING Abstract Only
I. Ya. Kremer and A. M. German *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 69 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 1, Jan. 1984 p 57-64 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-31509 California Univ., Los Angeles.
THE NEW ALGORTIHM FOR SYMBOLIC NETWORK ANALYSIS Ph.D. Thesis
John Tsai-Chiang Crow 1983 120 p
Avail: Univ. Microfilms Order No. DA8408785

A new and highly efficient tree identification algorithm is derived here for obtaining the determinant and the cofactors of a circuit's node admittance matrix, and hence, for obtaining various symbolic network functions for one-port and two-port reciprocal and nonreciprocal networks, with the network's topological description as its input. The algorithm is so devised that it is practically memory-storage free, and it is simple enough that even a microcomputer can obtain symbolic network functions for a fairly large circuit in a reasonably short time. It is worth noting that the algorithm can handle topological branches with infinite admittance values. Making use of this special feature, a simple topological model has been derived for the ideal operational amplifier, hence providing the ability to obtain various topological formulas of operational amplifier circuits in a reasonable time. Dissert. Abstr.

N84-31510 Connecticut Univ., Storrs.
THERMODYNAMIC FIELD THEORY OF THE DYNAMIC BEHAVIOR OF BIPOLAR JUNCTION TRANSISTORS Ph.D. Thesis
Mohamed El-Sayed Aboulwafa 1983 148 p
Avail: Univ. Microfilms Order No. DA8408086

Bipolar junction transistors play an important role in integrated-circuits, whether monolithic, or hybrid. A substitute for other components that are hard to be integrated in the same substrate. The thermodynamic field theory is applied to an interfacial problem which has time-varying fields. The concepts of Thermodynamic Field Theory of Generalized Field TTGR is used to investigate the dynamic response of p-n junction devices when fed a small a-c signal. The TTGF is applied to a multijunction device: the bipolar transistor. Dissert. Abstr.

N84-31511*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A HIGH VOLTAGE ELECTRICAL POWER SYSTEM FOR LOW EARTH ORBIT APPLICATIONS
John R. Lanier, Jr. and John R. Bush, Jr. Jun. 1984 14 p refs
(NASA-TM-86453; NAS 1.15:86453) Avail: NTIS HC A02/MF A01 CSCL 09C

The results of testing a high voltage electrical power system (EPS) breadboard using high voltage power processing equipment developed at Marshall Space Flight Center and Ni-Cd batteries are discussed. These test results are used to extrapolate to an efficient, reliable, high capacity EPS for near term low Earth orbit, high power applications. EPS efficiencies, figures of merit, and battery reliability with a battery protection and reconditioning circuit are presented. Author

N84-31512*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DUAL ION BEAM DEPOSITION OF CARBON FILMS WITH DIAMONDLIKE PROPERTIES
Michael J. Mirtich, Diane M. Swec, and John C. Angus (Case Western Reserve Univ.) 1984 20 p refs Presented at the 11th Intern. Conf. on Met. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by the American Vacuum Society
(NASA-TM-83743; E-2080; NAS 1.15:83743) Avail: NTIS HC A02/MF A01 CSCL 09C

A single and dual ion beam system was used to generate amorphous carbon films with diamond like properties. A methane/argon mixture at a molar ratio of 0.28 was ionized in the low pressure discharge chamber of a 30-cm-diameter ion source. A second ion source, 8 cm in diameter was used to direct a beam of 600 eV Argon ions on the substrates (fused silica or silicon) while the deposition from the 30-cm ion source was taking place. Nuclear reaction and combustion analysis indicate H/C ratios for the films to be 1.00. This high value of H/C, it is felt, allowed the films to have good transmittance. The films were impervious to reagents which dissolve graphitic and polymeric carbon structures. Although the measured density of the films was approximately 1.8 gm/cu cm, a value lower than diamond, the films exhibited other properties that were relatively close to diamond. These films were compared with diamondlike films generated by sputtering a graphite target. Author

N84-31513*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECTS OF LITHIUM COUNTERDOPING ON RADIATION DAMAGE AND ANNEALING IN n(+)p SILICON SOLAR CELLS
I. Weinberg, H. W. Brandhorst, Jr., S. Mehta (Cleveland State Univ., Ohio), and C. K. Swartz 1984 12 p refs Presented at the 4th European Symp. on Photovoltaic Generators in Space, Cannes, France, 18-20 Sep. 1984
(NASA-TM-83755; E-2243; NAS 1.15:83755) Avail: NTIS HC A02/MF A01 CSCL 09A

Boron-doped silicon n(+)p solar cells were counterdoped with lithium by ion implantation and the resultant n(+)p cells irradiated by 1 MeV electrons. Performance parameters were determined as a function of fluence and a deep level transient spectroscopy (DLTS) study was conducted. The lithium counterdoped cells exhibited significantly increased radiation resistance when compared to boron doped control cells. Isochronal annealing studies of cell performance indicate that significant annealing occurs at 100 C. Isochronal annealing of the deep level defects showed a correlation between a single defect at E sub v + 0.43 eV and the annealing behavior of short circuit current in the counterdoped cells. The annealing behavior was controlled by dissociation and recombination of this defect. The DLTS studies showed that counterdoping with lithium eliminated three deep level defects and resulted in three new defects. The increased radiation resistance of the counterdoped cells is due to the interaction of lithium with oxygen, single vacancies and divacancies. The lithium-oxygen interaction is the most effective in contributing to the increased radiation resistance. Author

N84-31514*# Eaton Corp., Southfield, Mich. Engineering and Research Center.
AC PROPULSION SYSTEM FOR AN ELECTRIC VEHICLE, PHASE 2 Interim Report
James M. Slicker Jun. 1983 287 p
(Contract DEN3-211)
(NASA-CR-168244; DOE/NASA-0211-1; NAS 1.26:168244; ERC-TR-83024) Avail: NTIS HC A13/MF A01 CSCL 09C

A second-generation prototype ac propulsion system for a passenger electric vehicle was designed, fabricated, tested, installed in a modified Mercury Lynx vehicle and track tested at the Contractor's site. The system consisted of a Phase 2, 18.7 kw rated ac induction traction motor, a 192-volt, battery powered, pulse-width-modulated, transistorized inverter packaged for under rear seat installation, a 2-axis, 2-speed, automatically-shifted mechanical transaxle and a microprocessor-based powertrain/vehicle controller. A diagnostics computer to assist tuning and fault finding was fabricated. Dc-to-mechanical-system efficiency varied from 78% to 82% as axle speed/torque ranged from 159 rpm/788 nm to 65 rpm/328 nm. Track test efficiency results suggest that the ac system will be equal or superior to dc systems when driving urban cycles. Additional short-term work is being performed under a third contract phase (AC-3) to raise transaxle efficiency to predicted levels, and to improve starting and shifting characteristics. However, the long-term challenge to the system's viability remains inverter cost. A final report on the Phase 2 system, describing Phase 3 modifications, will be issued at the conclusion of AC-3. Author

N84-31515# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PHASE MODULATOR IN 41.650 MHz [MODULADOR DE FASE EM 401,650 MHZ]
Paulo Adabo and Jose Antonio Rodrigues Jul. 1984 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da Soc. de Brazileira para o Progr. da Cienc. - SBPC, Sao Paulo, 4-11 Jul. 1984
(INPE-3177-PRE/544) Avail: NTIS HC A02/MF A01

The design of a phase modulator in 401.650 MHz, which was developed as an alternative for the transmitter modulator of a meteorological and hydrological data collection system by satellite is presented. This system collects and transmits environmental data to a reception center by data collection platforms, through a satellite. The modulated carrier has an angle deviation of +60 deg or -60 deg, corresponding to the digital data levels. The modulator consists basically of a phase locked loop (PLL) with a voltage controlled oscillator (VCO) in 401.650 MHz. The VCO frequency is divided by 64 and phase locked to a high stability reference. The modulation is made at 401.650 MHz with the modulation signal introduced after the phase comparator. E.A.K.

N84-31516# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
P-I-N DIODE SWITCHES PROJECT [PROJETO DE CHAVES COM DIODO PIN]
Eduardo Antonio Parada Tude Jul. 1984 23 p ref Presented at the 36th Ann. Meeting of the SBPC (Sociedade Brasileira para o Progresso da Ciencia), Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3171-PRE/541) Avail: NTIS HC A02/MF A01

The design of PIN switches in microwaves, the action of the PIN diode as a switch in the on and off states and several types of switches are described. Two SPDT (single pole double throw) switches prototypes were designed. The first, at 400 MHz, presents 40 dB isolation and 0.75 db insertion. The second, at 2.2 GHz, has 20 dB isolation and insertion low better than 0.7 dB. Author

N84-31517# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYNTHESIS OF MIG-TYPE ELECTRON GUNS FOR GYROTRONS
Joaquim Jose Barroso deCastro, Antonio Montes, and Carlos Alberto Bonfim Silva Jul. 1984 12 p refs Presented at the 4th Simp. Nipo-Brasleiro de Cienc. e Tecnol., Sao Paulo, Brazil, 7-9 Aug. 1984
(INPE-3191-PRE/555) Avail: NTIS HC A02/MF A01

A synthesis method is used in the design of axially symmetrical guns in the moderate to high space charge regime. Self-consistent equations for the temperature limited emission case are used to represent the beam and solve the internal problem, under the requirement of laminar flow. The external problem is solved by integrating the equations with boundary conditions defined by the analytically extended solutions of the internal problem. This technique is used in the development of a gyrotron. M.A.C.

N84-31518# General Dynamics Corp., Fort Worth, Tex. Fort Worth Div.
EMBEDDED INFORMATION TRANSFER TECHNOLOGY ASSESSMENT Final Report, 30 Sep. 1982 - 17 Nov. 1983
L. A. Huff, J. Moreland, R. Allison, J. Elia, and B. Jerdee Wright-Patterson AFB, Ohio AFWAL 16 Apr. 1984 85 p
(Contract F33615-82-C-1842)
(AD-A142649; FZM-7151; AFWAL-TR-84-1021) Avail: NTIS HC A05/MF A01 CSCL 09/5

The objective of this study is to develop approaches for improved Line Replaceable Unit (LRU) internal communications, utilizing state-of-the-art techniques and technology, in order to reduce the growing number of interconnects with LRU's. Worst-case LRU data transfer requirements were established by analyzing internal signal routing, data rates, and duty cycles of the F-16 Fire Control Computer (FCC) and the Programmable Signal Processor (PSP). It was determined that 25/Mword/second is adequate for card-to-backplane (serial) transfers. Candidate designs for meeting these requirements were developed and then subjected to an extensive trade-off analysis. This analysis ultimately yielded the selection of Switched Network Electro-Optical (serial) and Electro-Optical Air-Gap (parallel) as the preferred approaches. The interface pin-count per module of the recommended designs has been reduced to approximately 40. This is substantially lower that the average of 250 connections per module in most conventional approaches and fulfills the primary objective of this program. Further, the zero insertion-force air-gap interfaces directly support modular architectures and enhance the prospects of making two-level maintenance concepts a practical reality. Author (GRA)

N84-31519# Technion Research and Development Foundation Ltd., Haifa (Israel).
FORMATION OF SILICIDE CONTACTS USING CODEPOSITED REFRACTORY METALS ALLOY FILMS Final Technical Report, Jan. - Dec. 1983
M. Eizenberg and A. Appelbaum Jan. 1984 33 p
(Contract DAJA45-83-C-0013; DA Proj. 1T1-61102-BH-57)
(AD-A142879) Avail: NTIS HC A03/MF A01 CSCL 09/1

Contact reactions of a Si substrate and thin films of co-deposited two refractory metals have been studied. Three systems have been chosen Ta-V, Ta-W and Ti-V. As reference also two bilayer structures for each system have been studied (e.g., Ta/W/Si and W/Ta/Si for the Ta-W system). In each system the dependence of the interaction with Si on annealing temperature and on alloy composition is investigated. The interdiffusion and silicide formation have been analyzed by Auger electron spectroscopy and X-ray diffraction. Author (GRA)

N84-31520# Thermacore, Inc., Lancaster, Pa.
POWER FLATTENING TECHNIQUES FOR RADIOISOTOPIC THERMOELECTRIC GENERATORS Interim Report, 1 Dec. 1983 - 16 Mar. 1984
G. Y. Eastman 11 Mar. 1984 58 p
(Contract N00014-84-C-0060; ARPA Order 4941)
(AD-A142937) Avail: NTIS HC A04/MF A01 CSCL 10/2

The objective of this program is the investigation of a novel means of reducing the potential ecologic hazards that may be associated with radioisotopic thermoelectric generators (RTG's). A number of short lived isotopes have lower toxicities and are more ecologically acceptable than the Plutonium 238 used at present. In addition, the shorter half lives significantly reduce the time period during which isotope encapsulation must be assured (approx. 10 half lives). The technical approach involves the use of a gas controlled heat pipe to maintain a nearly constant heat input to the thermoelectric converter in spite of the decay profile of a short live heat pipe-RTG system is expected to operate over at least two isotope half lives (4:1 turndown ratio), supplying a thermoelectric module with the heat required to generate one watt of electricity. The end product of the program is a proof of principle heat pipe demonstrating the desired heat transport and turndown capability. The program has three items of work: Survey of Technology Base; Design of Proof of Principle Heat Pipe; Heat Pipe Fabrication and Test. GRA

N84-31521# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
PRINCETON VLSI PROJECT Semiannual Report, period ending 26 Mar. 1984
R. J. Lipton 1984 86 p
(AD-A142959) Avail: NTIS HC A05/MF A01 CSCL 09/5

There are three major components to the project. The first is in the area of procedural design of VLSI circuits. The second is in the area of our census language, and the third is in the area of the testing of VLSI circuits. GRA

N84-31522# GTE Labs., Inc., Waltham, Mass.
LITHIUM CELL REACTIONS Interim Report
W. Clark, F. Dampier, A. Lombardi, and T. Cole Wright-Patterson AFB, Ohio AFWAL Dec. 1983 89 p
(Contract F33615-81-C-2070)

(AD-A142976; AFWAL-TR-83-2083) Avail: NTIS HC A05/MF A01 CSCL 10/3

The objectives of this program were: (1) investigate reactions occurring in the Li/SOCl2 cell for a range of specified test conditions and (2) perform detailed analyses for impurities present in cell components, assess the impact of each impurity on cell performance and safety and recommend concentration limits for detrimental impurities. The products of the reduction of SOCl2 were investigated using linear sweep voltammetry (LSV) and constant current coulometry in dimethylformamide (DMF) supporting electrolyte. Voltammetric analysis after 50 to 100% of the SOCl2 had been reduced on platinum or glassy carbon cathodes showed no signs of significant quantities of unstable intermediates with lifetimes from 0.1 to 48 hours. Quantitative infrared spectroscopy demonstrated that substantial amounts of SO2 are absorbed on Shawinigan carbon from 1.8M LiAlCl4/SOCl2-SO solutions. Chemical analyses of the reagents and cell components used in Li/SOCl2 cell construction were carried out as well as cell discharge tests to determine the impact of key impurities on cell performance. GRA

N84-31523# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

AUTOMATIC DIGITAL BATTERY CELL CAPACITANCE MEASUREMENTS

A. H. Zimmerman and P. K. Effa 15 Jun. 1984 19 p

(Contract F04701-83-C-0084)

(AD-A143143; TR-0084(4945-01)-2; SD-TR-84-15) Avail: NTIS HC A02/MF A01 CSCL 14/2

An instrument of general applicability constructed to automatically measure the capacitance (or impedance) of battery cells is described. Full, automatic, electrical characterization of a battery cell by a single device is made possible with the instrument's added ability to be programmed to charge and discharge the cells. The capacitance can be monitored with a precision of 0.05% and an accuracy of 1%. Data are presented for the capacitance of the nickel electrode at low states of charge as an example of application of the instrument. Author (GRA)

N84-31524# Brookhaven National Lab., Upton, N. Y. Materials Chemistry and Energy Conversion Div.

THE EFFECT OF CURRENT DENSITY ON ANODE DEPOLARIZATION ECONOMICS

Morris Beller Feb. 1984 13 p refs

(Contract DE-AC02-76CH-00016)

(DE84-010465; BNL-34493) Avail: NTIS HC A02/MF A01

A previous study analyzed the use of oxidizable species (anode depolarizers) to reduce the voltage required for hydrogen production in electrolytic cells. Subsequent experimental work indicated that, although voltage reductions were observed, the current density also decreased markedly. The tradeoff between reduced voltage and the increased capital cost resulting from lower current density operation are examined. A methodology for assessing the economic impact of potentially valuable by-products generated in the depolarization process is provided. DOE

N84-31525# California Univ., Berkeley. Lawrence Berkeley Lab.

ACTIVE MATERIAL REDISTRIBUTION RATES IN ZINC ELECTRODES: EFFECT OF ALKALINE ELECTROLYTE COMPOSITIONS HAVING REDUCED ZINC OXIDE SOLUBILITY Thesis

J. T. Nichols, F. R. Mclarnon, and E. J. Cairns Nov. 1983 210 p refs

(Contract DE-AC03-76SF-00098)

(DE84-010709; LBL-17397) Avail: NTIS HC A10/MF A01

Electrolytes with low hydroxide concentration were tested in 1.35 Ah tri-electrode Zn/NiOOH cells for their ability to reduce zinc redistribution rates. Three electrolytes were evaluated: a 3.5M OH(-) electrolyte, a 3.5M OH(-) to 3.4M F(-) electrolyte, and a hydroxide-borate electrolyte. The electrolytes were chosen to have a ZnO solubility approximately 25% of that in the standard 30% KOH-1% LiOH electrolyte (7.4 M OH(-)). A 6 hour charge rate and a 2.5 hour discharge rate were employed for the Teflon bonded, zinc oxide electrodes, to which 2% PbO was added to reduce hydrogen evolution. It was found that the zinc redistribution rates are lower for the electrolytes with reduced ZnO solubility. In addition, no zinc penetration of the separator occurred for some of the electrolytes, even with overpotentials of 100 to 290 mV. After 125 cycles, none of the cell capacities were limited by the zinc electrode during discharge, less than 2% inactive zinc was found in the zinc electrodes cycled in the hydroxide-fluoride and borate electrolytes. DOE

N84-31526# California Univ., Livermore. Lawrence Livermore Lab.

NORMAL ZONE DETECTORS FOR A LARGE NUMBER OF INDUCTIVELY COUPLED COILS, REVISION 1

E. W. Owen and D. W. Shimer 3 Nov. 1983 32 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983

(DE84-011053; UCRL-89966-Rev-1; CONF-831203-138-Rev-1) Avail: NTIS HC A03/MF A01

A method which uses two sets of voltage measurements to locate and measure one or more normal zones in any number of coupled coils is described. One set of voltages is the outputs of bridges that balance out the self induced voltages. The other set of voltages are the voltages across the coils, although alternatives are possible. The two sets of equations form a single combined set of equations. Each normal zone location or combination of normal zones has a set of these combined equations associated with it. It is demonstrated that the normal zone can be located and the correct set chosen, which determines the size of the normal zone. Only a few operations take place in a working detector: multiplication of a constant, addition, and simple decision making. The detector for each coil, although weakly linked to the other detectors, is independent. The effect on accuracy of changes in the system parameters is discussed. DOE

N84-31527# Stanford Linear Accelerator Center, Calif.

HIGH POWER RF KLYSTRONS FOR LINEAR ACCELERATORS

G. T. Konrad 7 May 1984 6 p refs Presented at Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7 May 1984

(Contract DE-AC03-76SF-00515)

(DE84-012074; SU-SLAC-Pub-3324) Avail: NTIS HC A02/MF A01

Design criteria and operating experience for two klystrons of differing power are described. A one-dimensional large signal code was used to design the tubes. Calculated operating parameters obtained from this code are presented. Based on standard klystron experience at SLAC high voltage breakdown, instabilities and RF window breakdown were expected to be problem areas. Current experience in these areas on the tube designs are summarized. In the case of the SLC klystron 50 MW at rated average power has been obtained at 315 kV with an efficiency of 45%. The fault rate has been found to be as low as one fault per 8 hour shift. The first 150 MW klystron had a conventional output cavity and produced 105 MW at the design beam voltage of 450 kV. At 475 kV a power of 122 MW with an efficiency of 43% were obtained. Design changes to obtain higher power and efficiency are incorporated in the second 150 MW tube and projections are made for future tubes. E.R.

N84-31528# Department of Energy, Washington, D. C.

DIGITAL ROTATION MEASUREMENT UNIT Patent Application

Stephen N. Sanderson, inventor (to DOE) Filed 30 Sep. 1983 26 p

(Contract DE-AC04-76DP-00789)

(DE84-010872; US-Patent-Appl-SN-538059) Avail: NTIS HC A03/MF A01

A digital rotation indicator is disclosed for monitoring the position of a valve member having a movable actuator. The indicator utilizes mercury switches adapted to move in cooperation with the actuator. Each of the switches produces an output as it changes state when the actuator moves. A direction detection circuit is connected to the switches to produce a first digital signal indicative of the direction of rotation of the actuator. A count

pulse generating circuit is also connected to the switches to produce a second digital pulse signal having count pulses corresponding to a change of state of any of the mercury switches. A reset pulse generating circuit is provided to generate a reset pulse each time a count pulse is generated. An up/down counter is connected to receive the first digital pulse signal and the second digital pulse signal and to count the pulses of the second digital pulse signal either up or down depending upon the instantaneous digital value of the first digital signal whereby a running count indicative of the movement of the actuator is maintained. DOE

N84-31529# Department of Energy, Washington, D. C.
QUANTUM WELL MULTIJUNCTION PHOTOVOLTAIC CELL Patent Application
Roger J. Chaffin and Gordon C. Osbourn, inventors (to DOE) Filed 8 Jul. 1983 19 p
(Contract DE-AC04-76DP-00789)
(DE84-011113; US-Patent-Appl-SN-512059) Avail: NTIS HC A02/MF A01

A monolithic, quantum well, multilayer photovoltaic cell comprises a p-n junction comprising a p-region on one side and an n-region on the other side, each of which regions comprises a series of at least three semiconductor layers, all p-type in the p-region and all n-type in the n-region; each of said series of layers comprising alternating barrier and quantum well layers, each barrier layer comprising a semiconductor material having a first bandgap and each quantum well layer comprising a semiconductor material having a second bandgap when in bulk thickness which is narrower than said first bandgap, the barrier layers sandwiching each quantum well layer and each quantum well layer being sufficiently thin that the width of its bandgap is between said first and second bandgaps, such that radiation incident on said cell and above an energy determined by the bandgap of the quantum well layers will be absorbed and will produce an electrical potential across said junction. DOE

N84-31530# Department of Energy, Washington, D. C.
IMPROVED PHOTOVOLTAIC CELLS AND ELECTRODES Patent Application
Terje Asbjorn Skotheim, inventor (to DOE) Filed 29 Jun. 1983 8 p
(Contract DE-AC02-76CH-00016)
(DE84-011105; US-Patent-Appl-SN-509076) Avail: NTIS HC A02/MF A01

Improved photovoltaic cells and electrodes for use therein, particularly electrodes employing amorphous silicon or polyacetylene coating are produced by a process which includes filling pinholes or porous openings in the coatings by electrochemical oxidation of selected monomers to deposit insulating polymer in the openings. Author

N84-31531# Department of Energy, Washington, D. C.
IMPROVED SUPERCONDUCTING MAGNET WIRE Patent Application
Ivan K. Schuller and John B. Ketterson, inventors (to DOE) Filed 16 Aug. 1983 7 p
(Contract W-31-109-eng-38)
(DE84-011233; US-Patent-Appl-SN-523990) Avail: NTIS HC A02/MF A01

A superconducting tape or wire is composed of alternating layers of copper and a niobium-containing superconductor such as niobium of NbTi, Nb3Sn or Nb3Ge. In general, each layer of the niobium-containing superconductor has a thickness in the range of abut 0.05 to 1.5 times its coherence length (which for Nb3Si is 41 A) with each copper layer having a thickness in the rage of about 170 to 600 A. With the use of very thin layers of the niobium composition having a thickness within the desired range, the critical field (H/sub c/) may be increased by factors of 2 to 4. Also, the thin layers of the superconductor permit the resulting tape or wire to exhibit suitable ductility for winding on a magnet core. These compositions also characterized by relatively high values of critical temperature and therefore will exhibit a combination of useful properties as superconductors. DOE

N84-31532# California Univ., Livermore. Lawrence Livermore Lab.
SWITCHING TRANSIENTS IN A SUPERCONDUCTING COIL
Earle W. Owen and Daniel W. Shimer 18 Nov. 1983 7 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-012592; UCRL-89205; CONF-831203-156) Avail: NTIS HC A02/MF A01

The transients caused by the fast dump of large superconducting coils were studied. Theoretical analysis, computer simulation, and actual measurements are used. It is found that the breaker opening time is the critical factor in determining the size and shape of the transient. Instantaneous opening of the breaker causes a lightly damped transient with large amplitude voltages to ground. Increasing the opening time causes the transient to become a monopulse of decreasing amplitude. The voltages at the external terminals are determined by the parameters of the external circuit. For fast opening times the frequency depends on the dump resistor inductance, the circuit capacitance, and the amplitude on the coil current. For slower openings the dump resistor inductance and the current determine the amplitude of the voltage to ground at the terminals. Voltages to ground are less in the interior of the coil, where transients related to the parameters of the coil itself are observed. DOE

N84-31533# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF THERMIONIC INTEGRATED CIRCUITS FOR APPLICATIONS IN HOSTILE ENVIRONMENTS
J. Byron McCormick, David K. Lynn, Dale Wilde, Robert Cowan, Douglas J. Hamilton (Arizona Univ., Tucson), William Kerwin (Arizona Univ., Tucson), and Richard Dooley 10 Apr. 1984 10 p ref Presented at the 2nd Symp. on Energy Eng. Sci., Argonne, Ill., 10-12 Apr. 1984
(Contract W-7405-eng-36)
(DE84-011374; LA-UR-84-1185; CONF-8404123-2) Avail: NTIS HC A02/MF A01

A class of devices known as thermionic integrated circuits (TICs) that are capable of extended operation in ambient temperatures up to 500 C and in high radiation environments are described. The evolution of the TIC concept is discussed. A set of practical design and performance equations is demonstrated. Recent experimental results are discussed in which both devices and simple circuits have successfully operated in 500 C environments for extended periods of time. DOE

N84-31534# California Univ., Livermore. Lawrence Livermore Lab.
ALTERNATIVE POWER SUPPLY AND DUMP RESISTOR CONNECTIONS FOR SIMILAR, MUTUALLY COUPLED, SUPERCONDUCTING COILS
E. W. Owen, D. W. Shimer, and S. T. Wang 30 Nov. 1983 6 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983
(Contract W-7405-eng-48)
(DE84-012602; UCRL-89204; CONF-831203-141) Avail: NTIS HC A02/MF A01

Alternative methods of connecting similar mutually coupled coils to their power supplies and dump resistors are investigated. The circuits are evaluated for both operating and fault conditions. The factors considered are the voltage to ground during a dump, short cicuits, open circuits, quenches, and failure of the protection system to detect a quench. Of particular interest are the currents in coils that remain superconducting when one or more coils quench. The alternative connections include combined power supplies, individual dump resistors, combined resistors and series and parallel dump resistors. A new circuit that contains coupling resistors is proposed. The coupling resistors do not affect normal fast dumps but reduce the peak induced currents while also reducing the energy rating of the dump resistors. The series circuit with diodes, is discussed. The MFTFB central cell solenoids are used as an example. DOE

N84-31535# California Univ., Berkeley. Lawrence Berkeley Lab.
TECHNOLOGY BASE RESEARCH PROJECT FOR ELECTROCHEMICAL ENERGY STORAGE Executive Summary Report, 1983
K. Kinoshita, ed. 11 May 1984 19 p refs
(Contract DE-AC03-76SF-00098)
(DE84-012248; LBL-17741) Avail: NTIS HC A02/MF A01

The research base in the development of electrochemical technology for electric vehicle and stationary energy storage applications is discussed. The objective of the technology base research (TBR) project is to provide advanced electrochemical systems that satisfy stringent performance and economic requirements for electric vehicle and stationary energy storage applications. The TBR project is divided into four major project elements: electrochemical systems research, supporting research, electrochemical processes, and fuel cells for vehicles. The research, financial and management activities relevant to the TBR project in CY 1983 are summarized. Highlights of each project element are summarized according to the appropriate battery system or electrochemical research area. DOE

N84-31536# Oak Ridge National Lab., Tenn. Atomic, Molecular and High Voltage Physics Group.
TRANSPORT PROPERTIES AND DIELECTRIC STRENGTHS OF GAS MIXTURES FOR USE IN DIFFUSE DISCHARGE OPENING SWITCHES
S. R. Hunter, J. G. Carter, L. G. Christophorou, and V. K. Lakdawala 1984 15 p refs Presented at the 4th Intern. Symp. on Gaseous Dielec., Knoxville, Tenn., 29 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE84-011444; CONF-840403-1) Avail: NTIS HC A02/MF A01

Measurements of the electron drift velocity, attachment, diffusion, and ionization coefficients, and high voltage dielectric strengths of several gas mixtures proposed as candidates for use in diffuse discharge switching applications are presented. These mixtures include C3F8/Ar, C3F8/CH4, C2F6/Ar, C2F6/CH4, CF4/Ar, CF4/CH, CF3OCF3/Ar, and CF3OCF3/CH4. For some of these mixtures, the above transport and dielectric strength measurements are performed over the concentration range from 0 to 100% of the attaching gas in the nonattaching buffer gas. Knowledge of the nature and magnitude of the recombination processes in the discharge, along with the gas ionizing efficiency of the e-beam (which is a measure of the average energy required to produce a positive ion-electron pair in the discharge) is of value in modeling the temporal behavior of the electron conductivity in the discharge. Measurements of these parameters and the decomposition of the gas by the external electron beam is currently being studied. E.R.

N84-31537# Sandia Labs., Albuquerque, N. Mex. Exploratory Batteries Div.
ENHANCED LOW-TEMPERATURE PERFORMANCE OF A MULTICELL LISOC1SUB2 BATTERY
Henry K. Street 1984 8 p refs Presented at the 31st NASA/US Army Power Sources Symp., Atlantic City, 11 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-011680; SAND-84-0520C; CONF-840662-1) Avail: NTIS HC A02/MF A01

A battery pack with a long life, low current, multitap power supply utilizing lithium thionyl chloride cells (LTC) is described. The battery was developed to provide power to a portable solid state recording accelerometer. The battery pack utilizes 10 Li/SOC12 type LTC-7PN keeper 2 cells. These cells are wired in a series parallel arrangement to provide two 6 volt outputs and two negative 3 volt outputs with a single common. Four 301 K ohm resistors are internally mounted and wired to permit an optional continuous 12 microampere current drain from the cells to eliminate voltage delay effects at very low temperatures. The prewired assembly is encapsulated, using Stepen Foam H-102N rigid polyurethane 2 lbs/ft(3) foam, molded to a density of 4 lbs/ft(3). DOE

N84-31538# Sandia Labs., Albuquerque, N. Mex.
EMERGING BATTERY TECHNOLOGIES
J. L. Chamberlin 1984 13 p refs Presented at Lead Ind./Zinc Inst. Joint Meeting, Denver, 3 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-011193; SAND-84-0684C; CONF-8404142-1) Avail: NTIS HC A02/MF A01

The need for energy storge and the resulting research programs are discussed. Some results or lead-acid batteries, zinc/chloride batteries, and zinc/bromine batteries are provided. The potential market is examined. DOE

N84-31539# Argonne National Lab., Ill. Chemical Technology Div.
GLASS ELECTROLYTES FOR SODIUM/SULFUR CELLS
M. F. Roche and G. H. Kucera 1984 5 p refs Presented at the 6th DOE Battery and Electrochem. Contractors' Conf., Washington, D.C., 25 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-013428; CONF-840677-2) Avail: NTIS HC A02/MF A01

A glass electrolyte for use in sodium/sulfur batteries that has a low resistivity (100 ohm-cm at 300 (0)C) ans is stable in the cell environment was investigated. Glasses in the quaternary system: soda, alumina, zirconia and silica were studied. The main program elements are: (1) conductivity measurements at 300 to 500(0)C; (2) differential thermal analysis for determination of glass transition and crystallization temperatures; (3) static corrosion tests at 400(0)C using Na, Na2S4, and S; (4) mechanical strength and fracture toughness measurements; and (5) sodium/sulfur cell tests at 350(0)C. Fourteen quaternary glasses with a broad range of compositions were made. The resistivities of these glasses at 300(0)C extended from 130 to 3704 ohm-cm; the activation energies for conduction extended from 0.48 to 0.684 eV, and the glass transition temperatures extended from 397 to 685(0)C. Through a multiple linear regression analysis of these data response surfaces were generated for resistivity, activation energy for conduction, and glass transition temperture over the composition region within the quaternary system that is bounded by SiO2, Na2O3, Na2AlO4 and Na2ZrO3. The response surfaces indicate a new region of high conductivity and high glass transition temperature in the neighborhood of 42% soda, 31% silica and 27% alumina plus zirconia. DOE

N84-31540# Battelle Columbus Labs., Ohio.
STUDY OF BIPOLAR BATTERIES
J. E. Clifford Jun. 1984 53 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013193; SAND-84-7108) Avail: NTIS HC A04/MF A01

The status of development of bipolar batteries with an aqueous electrolyte was determined. Included in the study were lead-acid, nickel-cadmium, nickel-zinc, nickel-iron, and nickel-hydrogen batteries. The technical and patent literature is reviewed and a bibliography covering the past 15 years is presented. Literature data are supplemented by a survey of organizations. The principal interest was in bipolar lead-acid batteries and more recently in bipolar nickel-hydrogen batteries for space applications. DOE

N84-31541# Tennessee Valley Authority, Chattanooga. Div. of Energy.
TEST AND EVALUATION OF THE PHILIPS MODEL PE 1701 AND LESTER MODEL 9865 ELECTRIC VEHICLE BATTERY CHARGERS
R. W. Reese, R. L. Driggans, and A. S. Keller Apr. 1984 80 p ref Sponsored by EPRI
(EPRI Proj. 1136-18)
(DE84-901243; TVA/OP-EDT-84-25) Avail: NTIS HC A05/MF A01

The Philips Model PE 1701 and the Lester Model 9865 electric vehicle battery chargers were tested. Charger input/output voltage, current, power characteristics, and input waveform distortion were measured and induced electromagnetic interference was evaluated while the chargers recharged a fully discharged lead-acid battery pack. Electrical quantities were measured with precision volt-

ampere-watt meters, frequency counters, a digital storage oscilloscope, and a spectrum analyzer. The Philips charger required 12.2 hours to recharge a 144-V battery; it had an energy efficiency of 86.0% and a specific power of 87.4 W/kg. Input current distortion was between 6.9 and 23.0 percent, and electromagnetic interference was observed on AM radio. The Lester charger required 8.2 hours to recharge a 106-V battery; it had an energy efficiency of 83.0% and a specific power of 117.3 W/kg (53.3 W/lb). Current distortion was between 52.7 and 97.4%, and electromagnetic interference was observed on AM radio. DOE

N84-31542# Sandia Labs., Albuquerque, N. Mex.
MULTICELL LISOCl SUB 2 RESERVE BATTERY
Arlen R. Baldwin and Kurt F. Garoutte (Honeywell Power Sources Center) 1984 11 p Presented at the 31st Power Sources Symp., Cherry Hills, N.Y., 12 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012812; SAND-83-2273C; CONF-8406119-2) Avail: NTIS HC A02/MF A01

Recent development work on reverse lithium thionyl chloride (RLTC) batteries at SNLA and Honeywell has included safety and performance evaluations. The RLTC battery is being considered for applications that were traditionally fulfilled by state-of-the-art thermal batteries and reserve silver oxide zinc electrochemical systems. These applications typically demand a reserve battery having a rapid voltage rise, high reliability, operational safety and useful active lifetime ranging from minutes to hours. The RLTC work reported here was directed toward a power battery capable of meeting or exceeding the design requirements. Performance and safety test data indicate that the RLTC battery may be better suited than thermal batteries for some long-life applications. A comparison between Li(Si)/FeS2 thermal battery and an RLTC battery, both of which were designed to fulfill the requirements is presented. DOE

N84-31543# Florida Univ., Gainesville.
OPTIMUM CONTROL OF ELECTRIC MOTOR DRIVES FOR INDUSTRIAL ROBOTS
A. Guez and M. Roberts 19 Apr. 1983 8 p refs Presented at PCI/MOTORCON 1983 Conf., Orlando, Fla., 19 Apr. 1983
(Contract DE-AC05-79ER-10013)
(DE84-012878; CONF-830491-3) Avail: NTIS HC A02/MF A01

The industrial robot employs many actuators (electric motor drives) to perform a variety of tasks. Multilink manipulator arms, metal contouring machines, remote control tanks, and solar panels for satellites are just a few examples of applications for multiactuator systems. The first major problem is in the coupled, nonlinear structure of the interacting actuators. The second major problem is to find the optimum trajectories of motion. Determining the optimum control input for each drive is a difficult problem to solve. Due to the complex set of equations which govern the system, a great deal of simplification is necessary if a real-time computer is to be used to optimally control the motor drives. This paper describes a method for optimizing the performance (in this case, to minimize time of control) of these motorized actuators by automatically generating the input voltage signals. DOE

N84-31544# Argonne National Lab., Ill.
MOLTEN CARBONATE FUEL CELL CATHODE DEVELOPMENT
J. L. Smith, T. D. Kaun, N. Q. Minh, E. H. VanDeventer, F. C. Mrazek, and R. D. Pierce 1984 5 p refs Presented at Intern. Soc. of Electrochem., Berkeley, Calif., 5 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-012101; CONF-840853-3) Avail: NTIS HC A02/MF A01

From the results obtained so far, Li2MnO3 and LiFeO3 look promising as cathode materials for the MCFC. The materials have low solubility in the molten electrolyte and do not migrate under cell operating conditions. However, further studies of their resistivity is required before they can be fully assessed. Zinc oxide does not appear to be a good cathode material candidate due to its high solubility and its incorporation into the LiAlO2 matrix, although the conductivity of doped ZnO is low enough for its application as a cathode. DOE

N84-31545# Argonne National Lab., Ill.
A COMPUTERIZED SYSTEM FOR ESTABLISHING ELECTRIC-VEHICLE BATTERY REQUIREMENTS
W. W. Marr and W. J. Walsh 1984 7 p refs Presented at the Intersociety Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-011728; CONF-840804-14) Avail: NTIS HC A02/MF A01

A computerized system for establishing performance requirements for electric vehicle batteries is described. This system, called EVA (Electric Vehicle Analysis), enables least-cost analyses to identify optimum battery characteristics for different vehicle types and missions. EVA incorporates various computational and modeling features from previous electric-vehicle analyses. It is a user-friendly, interactive software package that allows optimization of complex battery systems with relative ease. DOE

N84-31546# Los Alamos Scientific Lab., N. Mex.
ENERGY STORAGE CAPACITORS. LECTURE 4: APPENDIX
W. J. Sarjeant 1984 54 p refs Presented at the Graduate Course on High Voltage/Power Technology and at the Training Course on Power Conditioning Technology, Albuquerque, N. Mex.
(Contract W-7405-eng-36)
(DE84-010040; LA-UR-79-1044-App) Avail: NTIS HC A04/MF A01

The capacitor properties are reviewed which, includes dielectrics, induced polarization, and permanent polarization. Capacitance characteristics are discussed and modelled. These include temperature range, voltage, equivalent series resistance, capacitive reactance, impedance, dissipation factor, humidity and frequency effects, storage temperature and time, and lifetime. Applications of energy storage capacitors are discussed. DOE

N84-31547# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
A REVIEW OF ANODE PHENOMENA IN VACUUM ARCS
H. Craig Miller 4 Jun. 1984 46 p refs
(Contract DE-AC04-76DP-00656)
(DE84-012371; GEPP-TIS-802) Avail: NTIS HC A03/MF A01

Anode phenomena in vacuum arcs and arc modes at the anode, anode temperature measurements, anode ions, transitions of the arc into various modes, and theoretical explanations of anode phenomena are discussed. A vacuum arc can exhibit five anode discharge modes: (1) a low current mode in which the anode is basically passive, acting only as a collector of particles emitted from the cathode; (2) a second low current mode that can occur if the electrode material is readily sputtered; (3) a footpoint mode, characterized by the appearance of one or more luminous spots on the anode; (4) an anode spot mode in which one large or several small anode spots are present and (5) an intense arc mode where an anode spot is present, but accompanied by severe cathode erosion. The arc voltage is relatively low and quiet in the two low current modes and the intense arc mode. It is usually high and noisy in the footpoint mode, and it can be either in the anode spot mode. Anode erosion is low, negative, in the two low current modes, and it is low to moderate in the footpoint mode. Severe anode erosion occurs in both the anode spot and intense arc modes. DOE

N84-31548# Michigan Technological Univ., Houghton. College of Engineering.
PERFORMANCE AND TEST CRITERIA FOR DC FUSES, PHASE 1 Open-File Report, 30 Sep. 1982 - 18 Mar 1984
E. K. Stanek and D. O. Wiltanen Mar. 1984 177 p refs
(PB84-202662; BM-OFR-116-84) Avail: NTIS HC A09/MF A01 CSCL 08I

The development and test criteria for dc fuses used in coal mines is examined. Field tests are conducted in 10 coal mines in which transients are initiated on the dc system from which the parameters of the dc mine electrical power system could be determined. The data processing involves the use of a Fourier analyzer to filter noise and fit an exponential curve to the field waveforms. From this data analysis is possible to find the dc

system resistance, inductance, and time constant. A survey of nationally recognized laboratories is conducted to establish that the recommended test criteria are practical. GRA

N84-31131# Vought Corp., Dallas, Tex.
AIRCRAFT-STORE ELECTRICAL INTERCONNECTION SYSTEM (AEIS) FUNCTIONAL REQUIREMENTS
J. R. Perkins and D. E. Lautner *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 111-122 (For primary document see N84-31121 21-06)
(AD-P003527) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31132# Vought Corp., Dallas, Tex.
SIGNAL SET STANDARDIZATION FOR THE AIRCRAFT-STORE ELECTRICAL INTERCONNECTION SYSTEM
D. E. Lautner and J. R. Perkins *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 123-138 (For primary document see N84-31121 21-06)
(AD-P003528) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31141# Grumman Aerospace Corp., Bethpage, N.Y.
SINGLE CHIP MIL-STD-1553B BUS INTERFACE UNIT KEEPS PACE WITH CHIP SETS
S. Schaire *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 255-268 (For primary document see N84-31121 21-06)
(AD-P003537) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31142# Circuit Technology, Inc., Farmingdale, N.Y.
MIL-STD-1553B MARCONI LSI CHIP SET IN A REMOTE TERMINAL APPLICATION
A. DiMarino *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 269-275 (For primary document see N84-31121 21-06)
(AD-P003538) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31143# ILC Data Device Corp., Bohemia, N.Y.
MIL-STD-1553 INTERFACE APPLICATION NOTES
S. N. Friedman *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 277-294 (For primary document see N84-31121 21-06)
(AD-P003539) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31146# Marconi Avionics Ltd., Rochester (England).
THIRD GENERATION MIL-STD-1553B LSI CHIP SET
R. D. Beasley *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 315-325 (For primary document see N84-31121 21-06)
(AD-P003542) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31148# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-STD-1553B VALIDATION TESTING
D. J. Thorpe and K. V. Vakkalanka *In its* Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 337-347 (For primary document see N84-31121 21-06)
(AD-P003544) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31157# Tracor, Inc., Austin, Tex. Aerospace Group.
TRANSPORTABLE GPU (GENERAL PROCESSOR UNITS) CHIP SET TECHNOLOGY FOR STANDARD COMPUTER ARCHITECTURES
R. E. Fosdick and H. C. Denison *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 457-477 (For primary document see N84-31121 21-06)
(AD-P003553) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31169# Naval Avionics Center, Indianapolis, Ind.
NAVY PACKAGING STANDARDIZATION THRUSTS
J. R. Kidwell *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 617-632 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003564) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31177# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
WESTINGHOUSE USES USAF-DEVELOPED STANDARDS
C. S. Shyman *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 753-765 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003572) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31435# Joint Publications Research Service, Arlington, Va.
EQUIPMENT FOR MONITORING AND CONTROL OF TELEVISION TRANSMITTERS Abstract only
M. Krashterka *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 6 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 1, Jan. 1984 p 27-29 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31436# Joint Publications Research Service, Arlington, Va.
MULTI-CRITERIA APPROACH TO SELECTION OF OPTIMAL CONNECTIONS IN LARGE-SCALE INTEGRATED CIRCUITS Abstract only
B. V. Batalov, Ye. P. Lyasnikov, and V. M. Shchemelinin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 7 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 13, no. 1, Jan. 1984 p 3-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31437# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF INTEGRATED CIRCUIT ELEMENT DIMENSIONS TAKING INTO ACCOUNT REAL ETCHING PROFILE ACCORDING TO DIFFRACTION PATTERN Abstract only
In its USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 7-8 Transl. into ENGLISH from Elektrsvyaz, no. 12, Dec. 1983 p 1-8 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31438# Joint Publications Research Service, Arlington, Va.
REALIZATION OF HIGH-FREQUENCY FILTERS ACCORDING TO THEORY OF GUIDED SPHERICAL WAVES Abstract only
A. I. Knyaz and V. M. Draganov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 8 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 57-59 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31441# Joint Publications Research Service, Arlington, Va.
CIRCUIT ENGINEERING PRINCIPLES FOR CONSTRUCTION OF BIPOLAR LARGE-SCALE INTEGRATED CIRCUIT STORAGE DEVICES AND VERY LARGE-SCALE MAIN MEMORY Abstract only
A. A. Neklyudov, V. N. Savenkov, and A. G. Sergeyez *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 27 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 13, no. 1, Jan. 1984 p 15-23 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31442# Joint Publications Research Service, Arlington, Va.
DIELECTRIC-GRATING BAND-PASS FILTERS Abstract only
A. V. Vodolzhenko and V. B. Kazanskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 10-14 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31443# Joint Publications Research Service, Arlington, Va.
COLD-CATHODE GAS-DISCHARGE MODULATOR POWER TUBE Abstract only
V. P. Andronova, A. M. Arsh, V. I. Krizhanovskiy, A. I. Kuzmichev,

and A. I. Shendakov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 32-33 Transl. into ENGLISH from Izv. Ucheb. Zaved: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 85-86 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31445# Joint Publications Research Service, Arlington, Va.
OPERATING MODES OF SUPERCONDUCTING CURRENT CONVERTERS IN SERVICE Abstract Only
V. Ye. Ignatov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-Uee-84-008) 11 Jun. 1984 p 39 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 12, Jan. 1983 p 41-44 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31448# Joint Publications Research Service, Arlington, Va.
MICROWAVE PHASE MODULATORS USING SEMICONDUCTOR DIODES (SURVEY) Abstract only
A. A. Makarenko *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 45 Transl. into English from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 3-10 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31450# Joint Publications Research Service, Arlington, Va.
CALCULATION OF HYDRAULIC FRICTION LOSSES IN dc MOTORS FILLED WITH LIQUID DIELECTRIC Abstract only
V. P. Morozkin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 49-50 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 1, Jan. 1984 p 55-57 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31474# Ball Aerospace Systems Div., Boulder, Colo.
BROADBAND MICROSTRIP MATCHING TECHNIQUES
D. A. Paschen *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 119-138 (For primary document see N84-31467 21-32)
(AD-P003506) Avail: NTIS HC A17/MF A01 CSCL 09/5

N84-31475# Raytheon Co., Bedford, Mass. Missile Systems Div.
WIDEBAND MICROSTRIP RING RADIATOR
M. L. Lewis and J. F. Toth *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 139-160 (For primary document see N84-31467 21-32)
(AD-P003507) Avail: NTIS HC A17/MF A01 CSCL 09/5

N84-31476# Boeing Aerospace Co., Seattle, Wash.
BROADBAND CAVITY-BACKED SLOT USING PRINTED CIRCUIT TECHNOLOGY
W. A. Schneider, G. E. Miller, and R. J. Coe *In* RADC Proc. of the Antenna Appl. Symp., Vol. 2 Mar. 1984 p 161-177 (For primary document see N84-31467 21-32)
(AD-P003508) Avail: NTIS HC A17/MF A01 CSCL 09/5

N84-32035# Tokyo Denki Univ. (Japan).
STEADY STATE PERFORMANCE OF SINGLE-PHASE REACTION MOTOR
Hitoshi Ishiyama, Kunihiko Karube, and Naokichi Isobe *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 1-16 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32251# Naval Training Equipment Center, Orlando, Fla.
VHSIC (VERY HIGH SPEED INTEGRATED CIRCUITS) FOR TRAINING SYSTEMS
D. P. Glenn, H. T. Freedman (Honeywell, Inc., West Covina, Calif.), and J. A. Gardner (Honeywell, Inc., West Covina, Calif.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 274-286
(For primary document see N84-32223 21-81)
(AD-P003484) Avail: NTIS HC A17/MF A01 CSCL 09/5

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-31549 Cincinnati Univ., Ohio.
A DIRECT NUMERICAL METHOD FOR THE SOLUTION OF UNSTEADY NAVIER-STOKES EQUATIONS IN GENERALIZED ORTHOGONAL COORDINATES Ph.D. Thesis
Gary A. Osswald 1983 241 p
Avail: Univ. Microfilms Order No. DA8406109

An implicit numerical analysis is developed for the unsteady, incompressible, two-dimensional Navier-Stokes equations in generalized orthogonal coordinates. Two internal separated, viscous fluid flows, characterized by multiple length scales, are studied in detail. Comparisons with available laser-Doppler measurements are made for several backstep channel geometries. Tabulated separation and reattachment lengths, recirculation intensities, and vortex-center locations are given for the backstep channel and for channels with an asymmetric constriction over a wide range of Reynolds numbers. Predicated stream-function contours, vorticity contours, and horizontal velocity profiles are also provided. The velocity profiles are compared with experiment whenever possible. Three-dimensionality in the experimental data is revealed and a Taylor-Gortler vortex instability mechanism is discussed as a probable cause for this observed three-dimensionality. Dissert. Abstr.

N84-31550 Pennsylvania State Univ., University Park.
A SPACE-MARCHING METHOD FOR THE NAVIER-STOKES EQUATIONS FOR INTERNAL FLOWS Ph.D. Thesis
T. R. Govindan 1983 160 p
Avail: Univ. Microfilms Order No. DA8409042

A space marching method was developed to compute three dimensional viscous flows in internal geometries. The Navier-Stokes equations was posed as an initial value problem by neglecting the effects of streamwise diffusion and treating the streamwise pressure gradient as a known source term. The fully coupled system of equations was solved by a noniterative algorithm at each streamwise step of the computation. A global pressure iteration was used to capture the effects of the streamwise pressure gradient. The governing equations were written in a body fitted coordinate system so that the method can be used to predict flows in complex geometries. A low Mach number formulation of the equations was used to compute incompressible flow fields. A computer program was written to implement all aspects of the space marching algorithm. The boundary condition procedures in the program were isolated and are modular to accommodate the different types of boundary conditions needed in internal flow computations. All aspects of the space marching algorithm were tested by computing simple flows with known analytical solutions. Dissert. Abstr.

N84-31551 Illinois Univ., Urbana-Champaign.
NUMERICAL SOLUTION OF THE EULER AND THE NAVIER-STOKES EQUATIONS FOR A COMPRESSIBLE FLOW PROBLEM Ph.D. Thesis
Seung Ho Lee 1983 126 p
Avail: Univ. Microfilms Order No. DA8409983

An implicit noniterative finite difference method in conservative form is used to solve numerically the Euler and the Navier-Stokes equations for the compressible flow over a triconic body. The numerical solutions were obtained for the Euler equations for subsonic, transonic and supersonic flows. For the Navier-Stokes equations, solutions were obtained for subsonic and transonic

flows. The grid system was generated using an algebraic method. Experiments are performed to find the smallest artificial dissipation which gives an accurate numerical solution. The surface pressure distributions are in agreement with experimental results for the entire range of Mach numbers considered. Dissert. Abstr.

N84-31552*# Lassen Research, Manton, Calif.
RESEARCH STUDY: ORGANIZATION AND DEVELOPMENT OF ORGANIZED CONVECTION IN THE BOUNDARY LAYER Monthly Progress Report
R. W. Lee 1 May 1984 2 p
(Contract NAS8-34773)
(NASA-CR-171115; NAS 1.26:171115; MPR-19) Avail: NTIS HC A02/MF A01 CSCL 20D

The status of a study to investigate the convective structures found in Doppler lidar windfield data is reported. Projected research is mentioned briefly. R.S.F.

N84-31553*# Continuum, Inc., Huntsville, Ala.
COMPUTATIONAL FLUID MECHANICS UTILIZING THE VARIATIONAL PRINCIPLE OF MODELING DAMPING SEALS Monthly Progress Report, 1 Mar. - 31 Mar. 1984
31 Mar. 1984 3 p
(Contract NAS8-35508)
(NASA-CR-171114; NAS 1.26:171114) Avail: NTIS HC A02/MF A01 CSCL 20D

The pressure solution for incompressible flow was investigated in support of a computational fluid mechanics model which simulates the damping seals considered for use in the space shuttle main engine turbomachinery. Future work directions are discussed briefly. R.S.F.

N84-31554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CALCULATION OF BOUNDARY LAYERS OF OSCILLATING AIRFOILS
Tuncer Cebeci and Lawrence W. Carr (California State Univ., Long Beach) May 1984 28 p refs Prepared in cooperation with Army Research and Technology Labs., St. Louis
(NASA-TM-85943; A-9599; NAS 1.15:85943;
USAAVSCOM-TR-84-A-1) Avail: NTIS HC A03/MF A01 CSCL 20D

A two-point finite difference unsteady laminar and turbulent boundary layer computational method was used to investigate the properties of the flow around an airfoil (NACA 0012) oscillating through angles of attack up to 18 degrees, for reduced frequencies of 0.01 and 0.20. The unsteady potential flow was determined using the unsteady potential flow method of Geissler. The influence of transition location on stal behavior was investigated, using both experimentally determined transition information, and transition located at the pressure peak; the results show the need for viscous-inviscid interaction in future computation of such flows. Author

N84-31555# Cranfield Inst. of Tech., Bedfordshire (England).
ANOTHER LOOK AT THE USE OF COMPLEX SOURCES FOR THE GENERATION OF BODIES OF REVOLUTION IN INCOMPRESSIBLE FLOW
P. A. T. Christopher and H. D. Wealthy Apr. 1984 32 p
(CAR-8412; ISBN-0-947767-01-0) Avail: NTIS HC A03/MF A01

By the use of discrete axial distributions of imaginary source discs it is possible to generate a wide class of axisymmetric bodies. In particular thin odies with bluff ends may be obtained, as well as a variety of other shapes. These results, which were obtained by an indirect method, indicate that a re-formulation as a direct method is possible and this is being pursued. Author

N84-31556# Cranfield Inst. of Tech., Bedfordshire (England).
TRANSITION BIFURCATION BRANCHES IN NON-LINEAR WATER WAVES
E. F. Toro 3 Sep. 1984 22 p refs
(CAR-8418; ISBN-0-947767-15-0) Avail: NTIS HC A02/MF A01

The numerical computation of progressive free surface gravity waves on a horizontal bed is addressed. They are regarded as families of bifurcation branches (lambda, A) sub Q of constant discharge Q. Two transition values Q sub 1 and Q sub 2 were numerically determined with corresponding transition bifurcation branches that classify waves into three disjoint branch sets B sub 1, B sub 2 and B sub 3. Their members are families of waves (lambda, A) sub Q satisfying respectively the conditions O < Q(2) < or = Q(2) sub 1, Q(2) sub 1 < Q(2) < or = Q(2) sub 2 and Q(2) sub 2 < Q(2) < 8/27. The bifurcation patterns are analyzed in some detail from the computed bifurcation diagram which shows that in B sub 1 bifurcation is to the left and the amplitude A increases as the wavelength lambda decreases; in B sub 2 bifurcation is to the right and turning points are observed at nearly breaking point. In B sub 2 bifurcation is to the right and A increases montonically with lambda. Author

N84-31557# Cranfield Inst. of Tech., Bedfordshire (England). Dept. of Aerodynamics.
SPLASH AND SPRAY FROM ROAD VEHICLES AND ASSOCIATED TOPICS: A BIBLIOGRAPHY
N. A. Cowperthwaite Jun. 1984 16 p Sponsored by Dept. of Transport
(CAR-8425; ISBN-0-947767-10-X) Avail: NTIS HC A02/MF A01

Approximately 113 citations are given on some aerodynamic characteristics of motor vehicles on various road surfaces and under varying conditions. Some topics covered include: wet road friction at high speeds; water spray generated by road vehicles; effects of visibility on driver performance; spray patterns and suppression; highway and vehicular safety; drag and spray produced by pneumatic wheels moving through water layers; spray reducing devices for vehicles; surfaces laid to reduce splash and spray; water surface depth measurement; and pneumatic tire hydroplaning. E.R.

N84-31558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEPOSITION OF Na2SO4 FROM SALT-SEEDED COMBUSTION GASES OF A HIGH VELOCITY BURNER RIG
G. J. Santoro, S. A. Goekoglu (Analex Corp.), F. J. Kohl, C. A. Stearns, and D. A. Rosner (Yale Univ.) 1984 24 p refs Proposed for presentation at the TMS-AIME Fall Meeting, Detroit, 17-19 Sep. 1984
(NASA-TM-83751; E-2237; NAS 1.15:83751) Avail: NTIS HC A02/MF A01 CSCL 20D

The mechanism of deposition of Na2SO4 was studied under controlled laboratory conditions and the results have been compared to a recently developed comprehensive theory of vapor deposition. Thus Na2SO4, NaCl, NaNO3 and simulated sea salt solutions were injected into the combustor of a nominal Mach 0.3 burner rig burning jet fuel at constant fuel/air ratios. The deposits formed on inert collectors, rotation in the cross flow of the combustion gases, were weighed and analyzed. Collector temperature was uniform and could be varied over a large range by internal air cooling. Deposition rates and dew point temperatures were determined. Supplemental testing included droplet size measurements of the atomized salt solutions. These tests along with thermodynamic and transport calculations were utilized in the interpretation of the deposition results. Author

N84-31559*# Massachusetts Univ., Amherst.
A SELECTION PRINCIPLE IN BENARD-TYPE CONVECTION
George H. Knightly (Colorado Univ.) and D. Sather 1983 51 p refs
(Grants NAG2-278; NSF MCS-79-03555; NSF MCS-82-01539)
(NASA-CR-173869; NAS 1.26:173869) Avail: NTIS HC A04/MF A01 CSCL 20D

In a Benard-type convection problem, the stationary flows of an infinite layer of fluid lying between two rigid horizontal walls and heated uniformly from below are determined. As the temperature difference across the layer increases beyond a certain value, other convective motions appear. These motions areoften cellular in character in that their streamlines are confined to certain well-defined cells having, for example, the shape of rolls or

hexagons. A selection principle that explains why hexagonal cells seem to be preferred for certain ranges of the parameters is formulated. An operator-theoretical formulation of one generalized Bernard problem is given. The infinite dimensional problem is reduced to one of solving a finite dimensional system of equations, namely, the selection equations. These equations are solved and a linearized stability analysis of the resultant stationary flows is presented. R.S.F.

N84-31560*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AEROTHERMAL LOADS ANALYSIS FOR HIGH SPEED FLOW OVER A QUILTED SURFACE CONFIGURATION

George C. Olsen and Robert E. Smith Aug. 1984 15 p refs Presented at the AIAA 17th Fluid Dyn., Plasma Dyn. and Lasers Conf., Snowmass, Colo., 25-27 Jun. 1984 Previously announced in IAA as A84-38019

(NASA-TM-86280; NAS 1.15:86280) Avail: NTIS HC A02/MF A01 CSCL 20D

Attention is given to hypersonic laminar flow over a quilted surface configuration that simulates an array of Space Shuttle Thermal Protection System panels bowed in a spherical shape as a result of thermal gradient through the panel thickness. Pressure and heating loads to the surface are determined. The flow field over the configuration was mathematically modeled by means of time-dependent, three-dimensional conservation of mass, momentum, and energy equations. A boundary mapping technique was then used to obtain a rectangular, parallel piped computational domain, and an explicit MacCormack (1972) explicit time-split predictor corrector finite difference algorithm was used to obtain steady state solutions. Total integrated heating loads vary linearly with bowed height when this value does not exceed the local boundary layer thickness. O.C. (IAA)

N84-31561*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ELECTROLESS-PLATING TECHNIQUE FOR FABRICATING THIN-WALL CONVECTIVE HEAT-TRANSFER MODELS

Don E. Avery, Gary K. Ballard, and Maywood L. Wilson Aug. 1984 39 p refs

(NASA-TP-2349; L-15815; NAS 1.60:2349) Avail: NTIS HC A03/MF A01 CSCL 20D

A technique for fabricating uniform thin-wall metallic heat-transfer models and which simulates a Shuttle thermal protection system tile is described. Two 6- by 6- by 2.5-in. tiles were fabricated to obtain local heat transfer rates. The fabrication process is not limited to any particular geometry and results in a seamless thin-wall heat-transfer model which uses a one-wire thermocouple to obtain local cold-wall heat-transfer rates. The tile is relatively fragile because of the brittle nature of the material and the structural weakness of the flat-sided configuration; however, a method was developed and used for repairing a cracked tile. Author

N84-31562# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

NONSTATIONARY OBLIQUE-SHOCK-WAVE REFLECTIONS IN AIR

Robert Lionel Deschambault Jan. 1984 329 p refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada

(Contract DNA001-83-C-0266; Grant AF-AFOSR-0096-82)

(UTIAS-270; ISSN-0082-5255) Avail: NTIS HC A16/MF A01

The interferometric investigation of oblique-shock-wave reflections in air was conducted in the UTIAS 10 cm x 18 cm shock tube over steel wedges. The range of the incident shock Mach numbers M sub s was 1.1 < or = M sub s < or = 14.6. The wedge angle theta sub w ranged over 2 deg < or = theta sub w < or = 63.4 deg. Under these conditions it was possible to observe the four major types of nonstationary oblique-shock-wave reflections, i.e., regular reflection, single-Mach reflection, complex-Mach reflection, and double-Mach reflection. These were studied in air using finite and infinite-fringe techniques. The initial pressures of the experiments P sub 0 ranged from 0.67 (5) < or = P sub 0 < or = 101.33 (760) kPa (torr) and were conducted at room temperature, near 300 K. Where possible the initial pressures were kept as high as practicable to provide more numerous and detailed isopycnics of the flow fields. The new isopycnic data were compared with previous experimental results in nitrogen and several existing numerical simulations. Several cases in argon were considered as well. There is little doubt that numerical methods must be further improved to keep pace with the experimental results. A series of experiments was performed measuring the pressure history on and above the surface of a 40 deg wedge for several initial conditions. Along with the interferometric data these measurements provide insight into the complex flow fields observed in these experiments. Author

N84-31563# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

ANALYTICAL AND NUMERICAL STUDY OF THE FLOW IN A SHOCK TUBE WITH AN AREA CHANGE AT THE DIAPHRAGM SECTION

H. S. Murty and J. J. Gottlieb Nov. 1984 122 p refs Sponsored in part by Natural Sciences and Engineering Research Council

(UTIAS-TN-255; ISSN-0082-5263) Avail: NTIS HC A06/MF A01

The flow in a non-uniform shock tube with driver and channel sections of different cross-sectional areas, separated by a convergent-divergent throat section in which the diaphragm is located, is studied both analytically and numerically. A one-dimensional, quasi-steady flow analysis is applied, by using both isentropic-flow equations and non-isentropic Rankine-Hugoniot relations, to determine the asymptotic nature of the flow after the decay of all transient waves. The domains and boundaries between patterns and the variations of the strengths of the primary and secondary shock and rarefaction waves with the throat-to-channel area ratio and primary shock strength are presented for perfect diatomic gases and air. A complementary one-dimensional unsteady flow analysis that is applied numerically, by using the random choice method with an operator-splitting technique, to determine the transient wave motion that is initially formed subsequent to the diaphragm rupture. The numerical results show how the initial transient wave motion subsides with time to the flow patterns and properties predicted by the quasi-steady flow analysis, and that the non-ideal effects of friction, heat transfer, and head losses are generally small, if the application is a blast-wave simulator in which the blast-wave overpressures are below 4 atm. A.R.H.

N84-31564# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SIMPLIFIED NAVIER-STOKES EQUATIONS AND COMBINED SOLUTION OF NON-VISCOUS AND VISCOUS BOUNDARY LAYER EQUATIONS

Z. Gao 10 May 1984 14 p Transl. into ENGLISH from Lixue Xuebao (China), no. 3, Nov. 1982 p 606-611

(AD-A141634; FTD-ID(RS)T-0310-84) Avail: NTIS HC A02/MF A01 CSCL 20/4

Simplified Navier-Stokes equations and the combined solution of non-viscous and boundary layer equations are discussed. From the full Navier-Stokes equations and an analysis of the combined solution of non-viscous and boundary layer equations, simplified Navier-Stokes equations were worked out. A perturbation analysis which differs slightly from the match-perturbation-expansions of inner-outer layers developed by Van Dyke shows that the solution of the simplified Navier-Stokes equations are uniformly valid with accuracy of O(Re infinity (-1/2)) in the whole flow field, where Re infinity = P infinity U infinity L over Mu infinity, is the density of free stream, U infinity the x-component of velocity, L the characteristic length, and Mu infinity the dynamic viscosity of free stream. A.R.H.

N84-31565# Wisconsin Univ., Madison.

OSCILLATORY INSTABILITY IN A 2-FLUID BENARD PROBLEM Summary Report

Y. Renardy and D. D. Joseph (Minnesota Univ., Minneapolis) Apr. 1984 22 p Sponsored in part by NSF

(Contracts DAAG29-80-C-0041; DAAG29-82-K-0051)

(AD-A142792; MRC-TSR-2681) Avail: NTIS HC A02/MF A01 CSCL 12/1

Flows involving two incompressible viscous fluids exhibit nonuniqueness in the sense that many interface positions are allowed when their densities are equal. Two-fluid flows also have quite different dynamical features from one-fluid flows. The one-fluid Benard problem in which the fluid, lying between parallel horizontal plates, is heated from below has a static solution for which a linear stability analysis yields no complex eigenvalues. In this paper we show that when two fluids are involved, the arrangement in horizontal layers can have complex eigenvalues at criticality and therefore can sustain disturbances which are oscillatory in time. This may have application to the theory of convection in the Earth's mantle, which is sometimes based on the assumption that convection takes place in chemically uniform layers. GRA

N84-31565# Wisconsin Univ., Madison.
NUMERICAL SOLUTION OF VISCOPLASTIC FLOW PROBLEMS BY AUGMENTED LAGRANGIANS Summary Report
P. LeTallec May 1984 65 p
(Contract DAAG29-80-C-0041)
(AD-A142793; MRC-TSR-2690) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report describes an application of Augmented Lagrangian techniques to the numerical solution of quasistatic flow problems in incompressible viscoplasticity, focusing on cases where the internal viscoplastic dissipation potential is not a differentiable function of the material deformation rate. The stresses of elastic origin are neglected, and the variational formulation of these problems is approximated via mixed finite elements of order 1. Convergence results are proved or recalled, both for the finite element approximation and for the augmented lagrangian algorithm. A detailed study of the local minimization problems which occur in the augmented lagrangian decomposition of the above problems is also presented, together with several numerical results. These results were obtained using the MODULEF finite element code on a VAX 780 at the Mathematics Research Center and cover successively the case of Norton, of Bingham and of Tresca type materials. Author (GRA)

N84-31567# Naval Research Lab., Washington, D. C.
AIRBLAST SIMULATIONS USING FLUX-CORRECTED TRANSPORT CODES Interim Report
D. L. Book and M. A. Fry 30 May 1984 45 p
(N99-QAXA; Y99-QAXS)
(AD-A142820; AD-E000576; NRL-MR-5334) Avail: NTIS HC A03/MF A01 CSCL 18/3

Flow fields resulting from the passage of a blast wave through a mixture of high-explosive detonation products and air can be significantly altered as compared to a single phase medium. The description of the two phase flow has been numerically simulated in one (1-D) and two-dimensional (2-D) calculations using multi-dimensional flux corrected transport (FCT) techniques. Calculated and experimentally determined flow field have been compared. FCT is a finite difference technique for solving fluid equations in problems where sharp discontinuities arise. Shocks, slip surfaces, and contact surfaces are accurately modeled through the application of diffusion and anti-diffusion at each timestep. This diffusion is just large enough to prevent dispersive ripples and guarantees that all physically positive conserved quantities remain positive. Simulation of two phase flow is natural outgrowth of the FCT technique. Each species is treated as a separate fluid with the pressure terms in the energy and momentum equations providing the coupling. Moreover, the timestep-split feature of the most recent version of FCT allows extension from 1 D to 2 D simulation. Results are compared with shock tube and field test data. GRA

N84-31568# Wisconsin Univ., Madison. Mathematics Research Center.
HOPF BIFURCATION IN TWO-COMPONENT FLOW Technical Summary Report
M. Renardy and D. D. Joseph May 1984 31 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0029; Grants NSF MCS-79-27062; NSF MCS-82-15064)
(AD-A142844; MRC-TSR-2689) Avail: NTIS HC A03/MF A01 CSCL 12/1

The stability of viscosity-stratified bicomponent flow has been studied by long wave asymptotics, by short wave asymptotics and numerically. These studies have shown that interfacial instabilities arise from the viscosity difference between the two fluids. If the surface tension between the fluids is non-zero, then Hopf type bifurcations leading to traveling interfacial waves are expected. This paper proves a rigorous theorem establishing the existence of bifurcating solutions of this nature. Author (GRA)

N84-31569# Wisconsin Univ., Madison. Mathematics Research Center.
GLOBAL SOLUTIONS FOR THE ONE-DIMENSIONAL EQUATIONS OF A VISCOUS REACTIVE GAS Technical Summary Report
A. Bressan May 1984 22 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0069)
(AD-A142931; MRC-TSR-2697) Avail: NTIS HC A02/MF A01 CSCL 12/1

The behavior of a confined, heat-conductive, viscous, and chemically reactive gas is described by a system of partial differential equations which is of hyperbolic-parabolic type and is highly nonlinear. This paper proves the existence of a unique solution, global in time, for the corresponding initial-boundary value problem. The proof combines a local existence theorem with global a priori bounds on the solutions, and relies on a preliminary estimate for the total free energy of the system. From a physical point of view, these results show that the heat conductivity and the viscosity of the gas prevent shocks from developing, at all positive times, for arbitrarily large Lipschitz continuous initial data. GRA

N84-31570# Milcom, Inc., Needham, Mass.
EFFECT OF SPATIAL DECORRELATION ON NULLING PERFORMANCE OF LINEAR ADAPTIVE ARRAY Technical Report
P. A. Bello 30 Jun. 1983 136 p
(Contract DNA001-82-C-0273; DA Proj. S99-QAXH)
(AD-A143013; AD-E301408; D4-T1; DNA-TR-82-170) Avail: NTIS HC A07/MF A01 CSCL 17/2

The presence of a disturbed ionosphere can cause signal decorrelations in time, frequency, and space. This report is concerned with the impact of spatial decorrelations on the performance of an adaptive array used to null interfering sources and jammers. Attention is concentrated on the effect of spatial decorrelation between spaced broadbeam antenna elements rather than decorrelation across individual antenna apertures. While fully adaptive arrays are considered, more analysis and evaluation is carried out for the sidelobe canceller (SLC) configuration. Complex Gaussian channel fluctuations are assumed for the disturbed ionosphere. Three types of output SNR analyses are conducted: non-fading, fading with array time constants short enough to adapt to fading, and fading with array time constants too slow to adapt to fading. Most detailed analytical results are carried out for one or two antenna elements and slow fading time constants. However, some more general results on processing gain are obtained for a linear array of M SLC antennas and slow fading time constants where processing gain is defined here as the ratio of output SNR with the array functioning to achieve optimum performance to output SNR with no adaptive array. Curves and simple analytic expressions are given relating processing gain to a suitable decorrelation parameter. The latter, in turn, is related to the rms angle of arrival fluctuations. Error rate expressions are developed for coherent and incoherent FSK, PS K, and DPSK modems when used in conjunction with an SLC adaptive array. GRA

N84-31571# California Univ., Livermore. Lawrence Livermore Lab.
ANOTHER ATTEMPT TO OVERCOME THE BENT ELEMENT BLUES
P. M. Gresho and J. M. Leone, Jr. Feb. 1984 15 p refs Presented at 5th Intern. Conf. on Finite Elements in Water Resources,

Burlington, VT., 18 Jun. 1984
(Contract W-7405-eng-48)
(DE84-007785; UCRL-90449; CONF-840688-1) Avail: NTIS HC A02/MF A01

Patching of a perceived defect in the Galerkin finite element approximations to the pressure gradient is discussed. The problems associated with the bilinear velocity, piecewise constant pressure element for solving the incompressible Navier-Stokes equations are addressed. The discrete approximation to gradient of P on a mesh of distorted elements appears not very accurate; from a Taylor series viewpoint, this element is not meant to be bent. After exposing these alleged defects patching the gradient approximation proceeded. The time dependent equations are integrated and the advantages of the new approximation are demonstrated. DOE

N84-31572# California Inst. of Tech., Pasadena.
CALTECH-DOE PROGRAM ON NUMERICAL ANALYSIS, COMPUTING AND FUNDAMENTAL STUDIES OF MOTION, ENERGY AND MASS TRANSFER IN FLUIDS Summary Report, 1 Apr. 1983 - 31 Mar. 1984
1984 6 p refs
(Contracts DE-AT03-76ER-72012; DE-AM03-76SR-00767)
(DE84-008935; DOE/ER-72012/T1; SR-10) Avail: NTIS HC A02/MF A01

Research is summarized for flow in porous media, finite amplitude waves in viscous shear flow, vortex induced lift, vortex dynamics, curvilinear grids, Taylor vortex flows, and the Dean problem of steady viscous flow in a uniformly curved tubes. DOE

N84-31573# Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.
FLOW IN A TAPERED CENTRIFUGE
H. P. Greenspan Mar. 1984 21 p
(Contract DE-AC05-82OR-20900)
(DE84-012553; UVA-ER-914-84U; GCTG-24) Avail: NTIS HC A02/MF A01

Flow in a relatively short, tapered centrifuge is examined. The problem is formulated, various boundary layer regimes are analyzed, and the principal mass fluxes are calculated for general temperature and wall conditions. DOE

N84-31574# Sandia Labs., Albuquerque, N. Mex.
NEW APPROACH TO THE EFFECTIVE STRESS PRINCIPLE
Stephen L. Passman and David F. McTigue Mar. 1984 13 p refs Presented at the Eng. Foundation Conf. on Compressibility Phenomena in Subsidence, Henniker, N. H., 29 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006963; SAND-84-0064C; CONF-840721-1) Avail: NTIS HC A02/MF A01

A definition of the effective stress emerges naturally from mixture theory for a fluid saturated porous solid. The effective stress definition suggested by the mixture theory arises before any particular behavior for the matrix was stipulated. In contrast, many definitions in common usage are tied to specific constitutive models and are thus extraneous to the theory of stress. This difference is illustrated by specializing the mixture theory to the case of a linear elastic solid matrix, for which the well-established consolidation, or poroelasticity, theory of Biot is recovered exactly. DOE

N84-31575# California Univ., Livermore. Lawrence Livermore Lab.
PRESSURE EFFECTS ON WALL HEAT TRANSFER DURING FLAME QUENCHING
S. R. Vosen (Sandia Lab., Livermore, Calif.) and C. K. Westbrook 14 May 1984 26 p refs Presented at the Spring Meeting of the Combustion Inst., Boulder, Colo., 2-3 Apr. 1984
(Contract W-7405-eng-48)
(DE84-012265; UCRL-90835; CONF-8404104-3) Avail: NTIS HC A03/MF A01

Rates of time dependent wall heat transfer in high temperature and high pressure combustion chambers were predicted. Laminar flow near the cold wall is assumed, and global chemical kinetic mechanisms are used to describe the combustion of methane air and propane air mixtures. The effects of variations in fuel type, pressure, equivalence ratio, and thermal boundary layers on the wall heat flux are examined, and the calculated results are correlated in terms of characteristic time and energy units. DOE

N84-31576# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SURVEY AND ASSESSMENT OF HEAT OF REACTION TYPE CHEMICAL HEAT PUMPS
R. D. Sanders, Jr., D. F. Suciu, W. J. Toth, and P. M. Wikoff Apr. 1984 65 p refs
(Contract DE-AC07-76ID-01570)
(DE84-010988; EGG-PBS-6579) Avail: NTIS HC A05/MF A01

The development of technology to augment a significant portion of the manufacturing fuel requirements with the low grade energy contained in the industrial process waste heat streams is discussed. The development of mechanical and chemical heat pumps for industrial application were investigated. The state-of-the-art and heat of reaction chemical heat pump systems (HRCHP) were assessed. Significant potential for such a system is indicated. The assessment resulted in identification of 200 potential reactions. A computer program for the thermodynamic analysis of these reactions and preliminary conceptual designs for the Cyclohexane-Benzene, and the Isopropanol-Acetone Chemical Heat Pumps were developed. It is suggested that HRCHP's, using reactions in common use in the chemical industry, appear capable of heat pumping to higher temperatures than conventional chemical or mechanical heat pumps. DOE

N84-31577# Argonne National Lab., Ill.
EFFICIENT FINITE-DIFFERENCE CALCULATION PROCEDURE FOR MULTI-DIMENSIONAL FLUID FLOWS
S. P. Vanka and G. K. Leaf Apr. 1984 10 p refs Presented at 20th AIAA/ASME/SAE Joint Propulsion Conf., Cincinnati, 11 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-011710; CONF-8406120-1) Avail: NTIS HC A02/MF A01

An efficient numerical scheme was developed for the solution of the finite-differenced pressure linked fluid flow equations. The algorithm solves the set of nonlinear simultaneous equations by a combination of Newton's method and efficient sparse matrix techniques. In tests on typical recirculating flows the method is rapidly convergent. The method does not require any under-relaxation or other convergence-enhancing techniques employed in other solution schemes. It is currently described for two dimensional steady state flows but is extendible to three dimensions and mildly time-varying flows. The method is robust to changes in Reynolds number, grid aspect ratio, and mesh size. The algorithm and the results of calculations performed are reported. DOE

N84-31578# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER CODES FOR FLUID-STRUCTURE INTERACTIONS
W. H. McMaster Apr. 1984 16 p refs Presented at the ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract W-7405-eng-48)
(DE84-011068; UCRL-89724; CONF-840647-14) Avail: NTIS HC A02/MF A01

Three fluid dynamics codes are available for the analysis of fluid-structure interactions where the fluid motion is drastic enough to cause difficulties in the Lagrangian formulation. The fluid-structure-interaction algorithms in these codes have been developed for the analysis of the dynamic response of coupled fluid-structure systems. The fluid motion is computed using an Eulerian differencing formulation and the structural motion is determined from a finite element code. The coupling is affected across the Lagrangian boundary defining the structure. DOE

N84-31579# Argonne National Lab., Ill.
THERMAL OSCILLATIONS DOWNSTREAM OF AN ELBOW IN STRATIFIED PIPE FLOW

T. M. Kuzay and K. E. Kasza 1984 7 p refs Presented at Ann. Meeting of the Am. Nucl. Soc., New Orleans, 3 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-006550; CONF-840614-27) Avail: NTIS HC A02/MF A01

The test geometry, test methodology and the scope of the thermal transient induced pipe stratification studies are explained. Fluid temperature data from elbow inlet and exit plane thermocouples indicates the presence of large amplitude thermal fluctuations for conditions in which the horizontal pipe upstream of the elbow developed stratified flow induced by a pipe entrant thermal transient. Under severe transient conditions, thermal oscillations of amplitude of almost 70 percent of the pipe inlet transient temperature change are observed in the bulk flow. Transient conditions data and accompanying flow visualization test results show that the largest near wall thermal oscillations are located within and immediately downstream of the elbow. The thermal oscillations can cause thermal stripping and thermal fatigue stress cracking in the elbow region. A specially instrumented test section is fabricated to study these thermal fluctuations. DOE

N84-31580# Tennessee Valley Authority, Norris. Water Systems Development Branch.
A NUMERICAL SIMULATION OF HEAT TRANSFER IN EVAPORATIVE COOLING TOWERS
Dudley J. Benton Sep. 1983 37 p refs
(DE84-901142; TVA/PUB-84/30; WR28-1-900-110) Avail: NTIS HC A03/MF A01

A phenomenological analysis was developed for the processes which occur within an evaporative cooling tower. The analysis includes the basic principles of mass, momentum, and energy conservation and empirical elationships for component characteristics such as transfer and pressure drop coefficients. A computer model which simulates the processes occurring in evaporative cooling towers was developed. The results of this computer model are compared to field data to verify the analysis and the computer modeling. The computer model may be used to analyze the performance of existing towers or to predict the performance of alternative tower designs. DOE

N84-31581# Los Alamos Scientific Lab., N. Mex.
HEAT PIPE TECHNOLOGY DEVELOPMENT FOR HIGH TEMPERATURE SPACE RADIATOR APPLICATIONS
M. A. Merrigan, E. S. Keddy, J. T. Sena, and M. G. Elder 1984 8 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19-24 Aug. 1984
(Contract W-7405-eng-36)
(DE84-012444; LA-UR-84-1673; CONF-840804-17) Avail: NTIS HC A02/MF A01

Technology requirements for heat pipe radiators, potentially among the lightest weight systems for space power applications, include flexible elements, and improved specific radiator performance (kg/kW). A flexible heat pipe capable of continuous operation through an angle of 180(0) was demonstrated. The effect of bend angle on the heat pipe temperature distribution is reviewed. Lightweight membrane heat pipe radiators that use surface tension forces for fluid containment were analyzed. The design analysis of these lightweight heat pipes is described and a potential application in heat rejection systems for space nuclear power plants is outlined. DOE

N84-31582# Los Alamos Scientific Lab., N. Mex.
TWO-DIMENSIONAL VAPOR FLOW ANALYSIS IN HEAT PIPES
F. C. Prenger and C. A. Busse (Joint Research Center of the European Communities, Ispra, Italy) 1984 10 p refs Presented at the 1st SP-100 Program Integration Meeting, Danvers, Mass., 13-15 Jun.984
(Contract W-7405-eng-36)
(DE84-012581; LA-UR-84-1705; CONF-8406131-2) Avail: NTIS HC A02/MF A01

The computer code AGATHE which is intended to evaluate axially symmetric heat pipes with compressible vapor flow at Mach numbers up to one and at all radial Reynolds numbers is discussed. The code evaluates empirical factors which describes turbulence. Heat input and output are modeled by describing liquid heat transfer loops. The method leads to nonuniform heating and cooling rates typical of actual heat pipes. The code is adapted to evaluate heat pipes in tubular geometry composed of a series of heat transfer and adiabatic zones of cylindrical or conical shape. The two dimensional mathematical problem is reduced to a number of ordinary differential equations, which are integrated by a Runge-Kutta scheme. The reduction is achieved by starting from the Navier-Stokes equation using the boundary layer approximation; this approximation introduces the main limitation of the code, restricting its use to the calculation of vapor ducts with large length to diameter ratios. The velocity profile is simulated by a power series; the n-coefficients of this series are determined such that at each axial position the radial pressure gradient is approximately zero, as specified by the boundary layer approximation. DOE

N84-31583# Los Alamos Scientific Lab., N. Mex.
HEAT PIPE DEVELOPMENT STATUS
Michael A. Merrigan 1984 10 p Presented at the 1st SP-100 Program Integration Meeting, Danvers, Mass., 13-15 Jun. 1984
(Contract W-7405-eng-36)
(DE84-012580; LA-UR-84-1704; CONF-8406131-3) Avail: NTIS HC A02/MF A01

Test heat pipes were operated in the 1400 K to 1700 K range for periods in excess of 20,000 hours to understand and control corrosion and failure mechanisms. The heat pipe analysis that was operated for 25,216 hours at 1700 K and the implications for heat pipe lifetime are discussed. Transient heat pipe behavior is investigated. This investigation was conducted as a result of restart problems encountered during life test of a 2 m. radiation cooled heat pipe. The results of a series of shut down tests from power and temperature are given and probable causes of the restart problem discussed. DOE

N84-31584# California Univ., Berkeley. Lawrence Berkeley Lab.
CONTINUUM THEORY FOR FIBER SUSPENSIONS
G. G. Lipscomb, R. Keunings, G. Marrucci, and M. M. Denn May 1984 9 p refs Presented at the 9th Intern. Congr. on Rheology, Acapulco, Mexico
(Contract DE-AC03-76SF-00098)
(DE84-012258; LBL-17734; CONF-841076-1) Avail: NTIS HC A02/MF A01

A continuum constitutive equation which is obtained for suspensions of rigid rodlike fibers in a viscous Newtonian medium, enabling simultaneous calculation of the kinematics, stress distribution, and fiber orientation distribution is discussed. A closure approximation to derive the equation has little effect in flows where an exact solution for the orientation distribution is obtained. A finite element procedure is developed for the solution of boundary value problems in complex geometries like those encountered in processing. A near singularity at solid boundaries where the kinematical no slip condition is satisfied is treated. DOE

N84-31585# Pacific Northwest Lab., Richland, Wash.
STATE OF TECHNOLOGY OF DIRECT CONTACT HEAT EXCHANGING
R. W. Vallario and D. E. DeBellis May 1984 72 p refs
(Contract DE-AC06-76RL-01830)
(DE84-012824; PNL-5008) Avail: NTIS HC A04/MF A01

The state of technology development was assessed and the constraints to wider use of direct contact heat exchanger (DCHE) technology were evaluated. Many types of generic systems and end-use applications, both current and future were studied. Domestic and foreign experience with DCHE technology are compared, although the primary focus is on domestic experience. Twenty-two distinct applications of DCHE technology were identified and are examined. The general format is to: describe each system, explore its potential applications, discuss current and past research activities and identify major implentation barriers. Generic and specific R and D needs to overcome specific implementation barriers were identified. A list of DCHE systems/concepts is

classified into four major end use and a category for specialized (other) applications is included. DOE

N84-31586# Oak Ridge National Lab., Tenn.
PERFORMANCE TEST RESULTS OF A LITHIUM BROMIDE-WATER ABSORPTION HEAT PUMP THAT USES LOW-TEMPERATURE (60 DEG C(140 DEG F)) WASTE HEAT Final Report
W. R. Huntley Jun. 1984 64 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013129; ORNL/TM-9072) Avail: NTIS HC A04/MF A01

An absorption heat pump for upgrading industrial waste heat to process steam temperatures was developed. The heat pump uses lithium bromide and water as the working fluids and is designed to operate with waste heat temperatures ranging from 60 to 100(0). Performance data from the 45-kW(t) prototype heat pump show good agreement with theoretical predictions. The successful operation of this absorption heat pump prototype demonstrated that this concept is an easily operated and practical candidate for energy recovery from waste heat in industrial applications where low temperature process steam is needed. An adiabatic absorber section is incorporated into the machine to allow the diluted absorbent to reach its maximum temperature before delivering heat to the load. The prototype heat pump tested is a single stage machine, but two stage versions were theoretically evaluated which could obtain about twice the temperature boost when required. An economic analysis shows attractive payback times over a wide range of operating temperatures. DOE

N84-31587# Brown Univ., Providence, R. I. Div. of Engineering.
AN INVESTIGATION OF SINGLE-SUBSTANCE HORIZONTAL TWO-PHASE FLOW Ph.D. Thesis
David A. Dickinson and Paul F. Maeder Mar. 1984 186 p refs
(Contract DE-AC02-79ET-27225)
(DE84-012292; LA-UR-84-1189; GEOFLO/20) Avail: NTIS HC A09/MF A01

The dissertation presents the derivation of basic conservation equations for the phases. The combined equations are used to examine the phenomenon of slip and its practical limitations, the Fanno line for single-substance flow and the effect of slip on choking. Equations for critical mass flux in the presence of slip are derived. The Mach, Reynolds and Froude numbers based on conditions at flashing are introduced as the characteristic parameters, and the importance of compressibility in single-substance two-phase flow is discussed. Experimental measurements of pressure change and void fraction for flow in the highly compressible range ($.5 < Ma < 1$) are presented. The working fluid is Refrigerant R-114, at room temperature, in a test section of diameter 5 cm and length 8 m. The effect of the Froude and Mach numbers is examined. The experimental facility is operated intermittently with running times of approximately two minutes and is instrumented for rapid measurements using a computer data acquisition and control system. A description of the facility and procedure is provided. DOE

N84-31588# Centre Technique des Industries Mecaniques, Senlis (France).
AMMONIA BOILING IN LONG TUBES. HEAT TRANSFER AND CHARGE LOSS IN VERTICAL AND HORIZONTAL TUBES Final Report [EBUILLITION DE L'AMMONIAC EN TUBE LONG. TRANSFERT DE CHALEUR ET PERTES DE CHARGES EN TUBES VERTICAL ET HORIZONTAL]
A. Malek and R. Colin Sep. 1983 65 p refs In FRENCH
(CETIM-14-C-011) Avail: NTIS HC A04/MF A01

Heat exchange and charge loss inside tubes carrying boiling ammonia, such as those found in nuclear power stations, were studied in the temperature range from 30 to 70 C. Mass flow, thermal load, and saturation pressure were investigated. For charge loss during two phase flow, an expression for the weight of a liquid-vapor mix column agrees with the experiments. Flow rate is not significant in either vertical or horizontal pipes. Author (ESA)

N84-31589# Centre Technique des Industries Mecaniques, Senlis (France).
COMPARATIVE STUDY OF HEAT PUMP REGULATION SYSTEMS. THE PROBLEM OF DEFROSTING EVAPORATORS Final Report [ETUDE COMPARATIVE DES SYSTEMES REGULATEURS DE PAC. PROBLEME DU DEGUVRAGE DES EVAOIRATEURS]
A. Malek 10 Jan. 1984 22 p refs In FRENCH
(CETIM-100250) Avail: NTIS HC A02/MF A01

Factors affecting the icing up of heat pumps during cold weather are recalled. Effects on performance are described. Frost detection methods are reviewed. Defrosting devices are assessed. Despite the number of theoretical solutions to defrosting, manufacturers favor only three approaches: switching-off the pump, reversing the cycle, and defrosting, using a differential pressostat. These solutions are adequate given the problem is limited to a few days per year. Author (ESA)

N84-31590# Centre Technique des Industries Mecaniques, Senlis (France).
MEASURE OF MASS FLOW RATE IN GAS-SOLID TWO PHASE FLUIDS; APPLICATION TO PNEUMATIC TRANSPORT Final Report [MESURE DU DEBIT MASSIQUE POUR DES FLUIDES BIPHASIQUES GAZ-SOLIDE; APPLICATION AU TRANSPORT PNEUMATIQUE]
S. Verney 18 Jan. 1984 14 p refs In FRENCH
Avail: NTIS HC A02/MF A01

Methods for measuring mass flows in gas solid fluids are reviewed. Flowmeters; simultaneous evaluation of average velocity and density; and volumetric analysis are discussed. Methods based on ionizing radiation, dielectric constant measurement, induced current measurement, ultrasonics, and correlation techniques are considered. Author (ESA)

N84-31591# Rome Univ. (Italy). Dipt. di Fisica.
ON THE STABILITY OF BOUNDARY-INDUCED FLOWS AND MODONS
Stefano Pierini 19 Oct. 1983 29 p refs
(Preprint-372) Avail: NTIS HC A03/MF A01

Sufficient stability conditions are used to check the stability of equivalent barotropic boundary induced flows, (simple inertial boundary currents and loop flows). It is found that the kinetic energy and entropy of a small scale perturbation superimposed on a large scale solitary wave do not grow in time. This property is proven to hold for equivalent modons, which are very resistant to small scale disturbances. Author (ESA)

N84-31592# National Aerospace Lab., Amsterdam (Netherlands). Hoofdafdeling: Ruimtevaart.
LIQUID FLOW THROUGH MESH-WIRE GAUZE WICKS
D. vandenAssem 9 May 1983 42 p refs In DUTCH; ENGLISH summary
(Contract NIVR-1833)
(NLR-TR-83104-U) Avail: NTIS HC A03/MF A01

A model for the fluid flow through a stack of one or more layers of wire gauze is described. The stack can be clamped between two flat walls or mounted on a wall or be completely free from walls. The flow direction is in the plane of the gauze layer. A model for the flow through a combination of a gauze and a slit between the gauze layer and the wall is also described. The model predicts the fluid transport through a gauze wick in a heat pipe. Author (ESA)

N84-31593# Technische Hogeschool, Eindhoven (Netherlands). Lab. for Power Transmission.
COMPUTATION OF THE FLUID-BORNE NOISE IN HYDROSTATIC SYSTEMS AND WAYS TO DECREASE IT Final Report, Nov. 1979
Ivo Petrus Jozef Maria Stulemeijer Bonn Bundesministerium fuer Forschung und Technologie May 1984 134 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-84-023; ISSN-0171-7618) Avail: NTIS

HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 28

The fluid noise pattern along the coordinates of the hydrostatic system (pump, rigid line, and needle valve) is described. A general computational method, based on a four pole description of the system components is proposed. A computer model to predict with great accuracy the fluid-borne noise in the system as a function of time and place is outlined. A nomogram for optimal design, related to the fluid-borne noise level of the hydrostatic system is presented. Author (ESA)

N84-31278# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
STATIONARY STATE COMPUTATIONAL FLUID DYNAMICS FOR AERO-PROPULSION DEVICES
G. J. Sturgess *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 25-52 refs (For primary document see N84-31276 21-20)
Avail: NTIS HC A05/MF A01 CSCL 20/4

N84-32054# Joint Publications Research Service, Arlington, Va.
STABILITY OF STATIONARY ROTATION OF CYLINDER FILLED WITH STRATIFIED VISCOUS INCOMPRESSIBLE FLUID Abstract Only
N. V. Derendyayev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 45 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Oct. 1983 p 1073-1076 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32056# Joint Publications Research Service, Arlington, Va.
TRANSITION FROM LAMINAR TO TURBULENT FLOW UNDER ACTION OF ACOUSTIC VIBRATIONS Abstract Only
A. N. Shelpyakov, A. M. Kasimov, and G. P. Isupov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 46 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 560-563 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32057# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF GAS JET IN LIQUID Abstract Only
V. A. Surin, V. N. Yevchenko, and V. M. Rubin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 47 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 542-554 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32058# Joint Publications Research Service, Arlington, Va.
FREE OSCILLATIONS OF IDEAL STRATIFIED FLUID IN CONTAINER Abstract Only
N. D. Kopachevskiy and A. N. Temnov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 47-48 Transl. into ENGLISH from Zh. Vychislitelnoy Mat. i Mat. Fiz. (Moscow), v. 24, no. 1, Jan. 1984 p 109-123 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32059# Joint Publications Research Service, Arlington, Va.
SIMILARITY CRITERIA FOR SPECTRA OF PRESSURE FLUCTUATIONS IN TURBULENT BOUNDARY LAYER AT WALL Abstract Only
B. M. Yefimtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 49 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 58-61 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32060# Joint Publications Research Service, Arlington, Va.
NONCONTRADICTORY METHOD OF CALCULATING RADIATION TRANSFER, AND PROBLEM OF SHOCK WAVE STRUCTURE Abstract Only
A. I. Vyskrebentsev, V. A. Nuzhnyy, and Yu. P. Rayzer *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 51 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 42-47 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32064# Joint Publications Research Service, Arlington, Va.
COEFFICIENT OF SURFACE FRICTION WITH TURBULENT FLOW IN BOUNDARY LAYER Abstract Only
V. M. Kapinos *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 58 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 46, no. 1, Jan. 1984 p 51-56 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32091# Joint Publications Research Service, Arlington, Va.
FLOW STRUCTURES AND THEIR EVOLUTION IN TURBULENT SHEAR LAYER Abstract Only
G. A. Kuzmin, O. A. Lukhachev, and A. Z. Patashinskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 30-31 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 74-80 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32092# Joint Publications Research Service, Arlington, Va.
MOTION OF VORTEX PAIR BETWEEN PARALLEL WALLS Abstract Only
P. I. Geshev and B. S. Yezdin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 31 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 62-67 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32108# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF NONLINEAR COMPRESSION PULSES THROUGH GRANULAR MEDIA Abstract Only
V. F. Nesterenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 87-88 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 136-148 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-31594*# Honeywell, Inc., Minneapolis, Minn. Solid State Electronics Div.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE, MODIFICATION NO. 5 Monthly Progress Report
P. J. Anderson, P. Nussbaum, and G. Gustafson May 1984 31 p
(Contract NAS8-34679)
(NASA-CR-171122; NAS 1.26:171122; MPR-8) Avail: NTIS HC A03/MF A01 CSCL 14B

Research concerning the development of pressure instrumentation for the space shuttle main engine is reported. The following specific topics were addressed: (1) transducer design and materials, (2) silicon piezoresistor characterization at cryogenic temperatures, (3) chip mounting characterization, and (4) frequency response optimization. R.S.F.

N84-31595*# Aerometrics, Inc., Mountain View, Calif.
ANALYSIS AND TESTING OF A NEW METHOD FOR DROP SIZE MEASUREMENT USING LASER SCATTER INTERFEROMETRY Final Report
W. D. Bachalo and M. J. Houser Aug. 1984 68 p refs
(Contract NAS3-23684)
(NASA-CR-174636; NAS 1.26:174636) Avail: NTIS HC A04/MF A01 CSCL 14B

Research was conducted on a laser light scatter detection method for measuring the size and velocity of spherical particles. The method is based upon the measurement of the interference fringe pattern produced by spheres passing through the intersection of two laser beams. A theoretical analysis of the method was carried out using the geometrical optics theory. Experimental verification of the theory was obtained by using monodisperse droplet streams. Several optical configurations were tested to identify all of the parametric effects upon the size measurements. Both off-axis forward and backscatter light detection were utilized. Simulated spray environments and fuel spray nozzles were used in the evaluation of the method. The measurements of the monodisperse drops showed complete agreement with the theoretical predictions. The method was demonstrated to be independent of the beam intensity and extinction resulting from the surrounding drops. Signal processing concepts were considered and a method was selected for development. Author

N84-31596*# Honeywell, Inc., Minneapolis, Minn. Solid State Electronics Div.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE, MODIFICATION NO. 5 Monthly Progress Report
P. J. Anderson, P. Nussbaum, and G. Gustafson Jul. 1984 30 p
(Contract NAS8-34769)
(NASA-CR-173860; NAS 1.26:173860; MPR-10) Avail: NTIS HC A03/MF A01 CSCL 14B

The purpose of Modification No. 5 of this contract is to expand the scope of work (Task C) of this research study effort to develop pressure instrumentation for the SSME. The objective of this contract (Task C) is to direct Honeywell's Solid State Electronics Division's (SSED) extensive experience and expertise in solid state sensor technology to develop prototype pressure transducers which are targeted to meet the SSME performance design goals and to fabricate, test and deliver a total of 10 prototype units. SSED's basic approach is to effectively utilize the many advantages of silicon piezoresistive strain sensing technology to achieve the objectives of advanced state-of-the-art pressure sensors in terms of reliability, accuracy and ease of manufacture. More specifically, integration of multiple functions on a single chip is the key attribute of this technology which will be exploited during this research study. B.W.

N84-31597*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NIGHTTIME OBSERVATIONS OF THUNDERSTORM ELECTRICAL ACTIVITY FROM A HIGH ALTITUDE AIRPLANE
M. Brook (New Mexico Inst. of Mining and Technology), C. Rhodes (New Mexico Inst. of Mining and Technology), O. H. Vaughan, Jr., R. E. Orville (State Univ. of New York, Albany), and B. Vonnegut (State Univ. of New York, Albany) Sep. 1984 32 p refs
(NASA-TM-86544; NAS 1.15:86544) Avail: NTIS HC A03/MF A01 CSCL 14B

Photographs from a NASA U-2 airplane flying over nocturnal thunderstorms show frequent lightning activity in the upper part of the cloud. In some cases, unobscured segments of lightning channels 1 km or longer are visible in clear air around and above the cloud. Multiple images of lightning channels indicate multiple discharges in the same channel. Photographs taken through a diffraction grating show that the lightning has a spectrum similar to that observed in the lower troposphere. Lightning spectra obtained with a slitless line-scan spectrometer show strong singly ionized nitrogen emissions at 463.0 and 500.5 nm. Field changes measured with an electric field-change meter correlate with pulses measured with a photocell optical system. Optical signals corresponding to dart leader, return stroke, and continuing current events are readily distinguished in the scattered light emerging from the cloud surface. The variation of light intensity with time in lightning events is consistent with predicted modification of optical lightning signals by clouds. It appears that satellite based optical sensor measurements cannot provide reliable information on current rise times in return strokes. On the other hand, discrimination between cloud-to-ground and intracloud flashes and the counting of ground strokes is possible using the optical pulse pairs which have been identified with leader, return-stroke events in the cloud-to-ground flashes studied. A.R.H.

N84-31598*# Alabama Univ., Huntsville. Dept. of Chemistry.
THE STUDY OF EFFICIENT LOW-POWER DIFFRACTION DESIGNS Final Report
J. C. Gregory Sep. 1984 42 p refs
(Contract NAS8-31170)
(NASA-CR-171142; NAS 1.26:171142) Avail: NTIS HC A03/MF A01 CSCL 14B

Topics covered include the design and fabrication of: (1) a nuclear radiation monitor for use in measuring the radiation environment of the space shuttle payload bay (part of the Spacelab 2 payload; (2) a parallel plate ion chamber for measuring ionization loss by relativistic heavy ions and (3) ionization chambers and proportional chambers for the active radiation detector on Spacelab 1. An experiment to measure the response of ion chambers and Cerenkox counters to relativistic argon and iron atoms is also described. A.R.H.

N84-31599*# Mechanical Technology, Inc., Latham, N. Y.
RESEARCH STUDY OF PRESSURE INSTRUMENTATION Final Report
Leo Hoogenboom and Greg Hull-Allen Jul. 1984 119 p refs
(Contract NAS8-35015)
(NASA-CR-171143; NAS 1.26:171143; MTI-84TR35) Avail: NTIS HC A06/MF A01 CSCL 14B

To obtain a more vibration resistant pressure sensor for use on the Space Shuttle Main Engine, a proximity probe based, diaphragm type pressure sensor breadboard was developed. A fiber optic proximity probe was selected as the sensor. In combination with existing electronics, a thermal stability evaluation of the entire probe system was made. Based upon the results, a breadboard design of the pressure sensor and electronics was made and fabricated. A brief series of functional experiments was made with the breadboard to calibrate, thermally compensate, and linearize its response. In these experiments, the performance obtained in the temperature range of -320 F (liquid N2) to +200 F was comparable to that of the strain gage based sensor presently in use on the engine. In tests at NASA-Marshall Space Flight Center (MSFC), after some time at or near liquid nitrogen temperatures, the sensor output varied over the entire output range. These large spurious signals were attributed to condensation of air in the sensing gap. In the next phase of development of this sensor, an evaluation of fabrication techniques toward greater thermal and mechanical stability of the fiber probe assembly must be made. In addition to this, a positive optics to metal seal must be developed to withstand the pressure that would result from a diaphragm failure. Author

N84-31600# Dayton Univ., Ohio.
DIFFERENTIAL SCANNING CALORIMETER DATA ACQUISITON SYSTEM Interim Report, Aug. 1982 - Jun. 1983
M. D. Houtz Wright-Patterson AFB, Ohio AFWAL May 1984 34 p
(AF Proj. 2419)
(AD-A143118; UDR-TR-82-153; AFWAL-TR-84-4055) Avail: NTIS HC A03/MF A01 CSCL 14/2

The kinetics of polymerization reactions are studied in our laboratory using differential scanning calorimeter (DSC) data at various temperature scanning rates and analyzed by a computer code based on a theory developed and expanded in this laboratory. This created the need for an efficient data acquisition system with a variable and accurate programmable data collection rate.

This report discusses one such successful data acquisition system using a Bascom Turner recorder (BTR). It is a combination chart recorder, calculator, floppy disk storage device, and interface allowing data to be transferred to a printer, CRT, or computer. Step-by-step procedures are presented. Author (GRA)

N84-31601# Department of the Army, Washington, D. C.
TEMPERATURE CONTROLLED ADJUSTING MECHANISM Patent Application
J. Kouroupis and J. J. Chino, inventors (to Army) 25 Jun. 1984 9 p
(AD-D011077; US-Patent-Appl-SN-623883) Avail: NTIS HC A02/MF A01 CSCL 14/2

This application describes a mechanism for providing precise (microradians) angular adjustment for high resolution adjustable mounts and platforms used to design optical elements. The mechanism includes temperature-controlled rods having internally embedded heater elements and thermistors attached to a stable platform. The heaters and thermistors are attached to a proportional control circuit which accurately and precisely regulates rod temperatures. GRA

N84-31602# Department of Energy, Washington, D. C.
FRONT LIGHTED OPTICAL TOOLING METHOD AND APPARATUS Patent Application
William J. Stone, inventor (to DOE) Filed 30 Jun. 1983 35 p
(Contract DE-AC04-76DP-00613)
(DE84-011108; US-Patent-Appl-SN-509554) Avail: NTIS HC A03/MF A01

An optical tooling method and apparatus uses a front lighted shadowgraphic technique to enhance visual contrast of reflected light. The apparatus includes an optical assembly including a fiducial mark, such as cross hairs, reflecting polarized light with a first polarization, a polarizing element backing the fiducial mark and a reflective surface backing the polarizing element for reflecting polarized light bypassing the fiducial mark and traveling through the polarizing element. The light reflected by the reflecting surface is directed through a second pass of the polarizing element toward the frontal direction with a polarization differing from the polarization of the light reflected by the fiducial mark. When used as a tooling target, the optical assembly may be mounted directly to a reference surface or may be secured in a mounting, such as a magnetic mounting. The optical assembly may also be mounted in a plane defining structure and used as a spherometer in conjunction with an optical depth measuring instrument. DOE

N84-31603# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR MEASURING RESPONSE TIME Patent Application
Edward W. Johanson and Charles August, inventors (to DOE) Filed 11 Aug. 1983 12 p
(Contract W-31-109-ENG-38)
(DE84-011042; US-Patent-Appl-SN-522282) Avail: NTIS HC A02/MF A01

A method of measuring the response time of an electrical instrument which generates an output signal in response to the application of a specified input, in which the output signal varies as a function of time and when subjected to a step input approaches a steady-state value, comprises: (1) applying a step input to predetermined value to the electrical instrument to generate an output signal; (2) simultaneously starting a timer; (3) comparing the output signal to a reference signal to generate a stop signal when the output signal is substantially equal to the reference signal, the reference signal being a specified percentage of the steady-state value of the output signal corresponding to the predetermined value of the step input; and (4) applying the stop signal when generated to stop the timer. DOE

N84-31604# Department of Energy, Washington, D. C.
PLASMA DISCHARGE ELEMENTAL DETECTOR FOR A MASS SPECTROMETER Patent Application
Richard A. Heppner, inventor (to NASA) Filed 3 Jun. 1983 45 p
(DE84-011078; US-Patent-Appl-SN-500717) Avail: NTIS HC A03/MF A01

A material to be analyzed is injected into a microwave-induced plasma discharge unit, in which the material is carried with a flow of buffer gas through an intense microwave energy field which produces a plasma discharge in the buffer gas. As the material exits from the plasma discharge, the material is sampled and conveyed along a capillary transfer tube to a mass spectrometer where it is analyzed. The plasma discharge causes dissociation of complex organic molecules into simpler molecules which return to the neutral ground state before they are analyzed in the mass spectrometer. The buffer gas is supplied to one end portion of the discharge tube and is withdrawn from the other end portion by a vacuum pump which maintains a subatmospheric pressure in the discharge tube. The sample material is injected by a capillary injection tube into the buffer gas flow as it enters the plasma discharge zone. The dissociated materials are sampled by an axial sampling tube having an entrance where the buffer gas exits from the plasma discharge zone. The sample material may be supplied by a gas chromatography having a capillary effluent line connected to the capillary injection tube, so that the effluent material is injected into the microwave induced plasma discharge. The microwave field is produced by a cavity resonator through which the discharge tube passes. Author

N84-31605# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif. Energy Measurements Group.
DEVELOPMENT OF LONG-LENGTH WIRE FILAMENT STRAIN GAGES
Dennis E. Reid and Christie A. Cordill 1984 9 p refs Presented at the 30th Intern. Instr. Symp., Denver, 7 May 1984 Prepared in cooperation with California Univ., Lawrence Livermore Lab.
(Contract DE-AC08-83NV-10282)
(DE84-011543; DOE/NV-10282/4066; CONF-840577-6) Avail: NTIS HC A02/MF A01

An extra long wire filament strain gage to ensure the integrity of an epoxy/sand/gravel plug for an underground explosion was developed. Extra long gages were required because it was important to know the strain level of the entire plug and commercial gages were typically less than 6 in. long. The extra long gages were designed and fabricated with lengths of between 1 and 10 ft; they weighed between 2 and 25 lb. The gages were fabricated by wrapping a fine filament wire onto a structural skeleton which was potted into a mold using the same epoxy/sand/gravel mixture as the plug. This results in a gage package that can be emplaced before the bulk of the plug is poured. Gages are built with both temperature compensating dummy legs and active Poisson legs included in the package. DOE

N84-31606# Sandia Labs., Livermore, Calif. Standards and Calibration and Photography Div.
THERMOCOUPLE SIMULATION: A CALIBRATION TECHNIQUE
P. A. Klevgard May 1984 20 p
(Contract DE-AC04-76DR-00789)
(DE84-012408; SAND-83-8043) Avail: NTIS HC A02/MF A01

The calibration temperature readout devices that employ a thermocouple probe is discussed. This readout is best accomplished if a thermocouple junction's voltage output is simulated at different temperatures and sent to the readout device. With the right equipment in an electrical calibration laboratory, a suitable computer controlled system can be constructed to simulate a given thermocouple junction for any selected temperature. DOE

N84-31607# Pacific Northwest Lab., Richland, Wash.
HOLOGRAPHIC INVESTIGATION OF THERMAL NONEQUILIBRIUM VAPOR GENERATION Interim Report
J. M. Bates Apr. 1984 9 p refs Presented at the 2nd DOE Energy Eng. Sci. Symp., Argonne, Ill., 10-11 Apr. 1984
(Contract DE-AC06-76RL-01830)
(DE84-011905; PNL-SA-12197; CONF-8404123-3) Avail: NTIS HC A02/MF A01

The vapor generation rate and associated thermal hydraulic parameters in a rapidly depressurizing, steady water flow was

measured for understanding of the thermal nonequilibrium vapor generation process. This phenomenon is important for prediction and analysis of blowdown and flashing processes which may occur in nuclear reactor safety analysis (Loss of Coolant Accidents), in characterizing the expansion and flow of Liquified Gas (LNG) and develops alternative energy sources such as solar and geothermal. The development of advanced predictive capabilities for design and analysis of these and other similar systems is considered. The holographic recording and image analysis methods may evolve into a reliable and useful tool for two phase flow investigations.
DOE

N84-31608# Tennessee Univ., Knoxville.
AUTOMATIC CAMERA TRACKING FOR REMOTE MANIPULATORS
R. S. Stoughton, H. L. Martin (ORNL), and R. R. Bentz (ORNL) Apr. 1984 28 p refs Presented at the ANS Topical Meeting on Robotics and Remote Handling in Hostile Environ., Gatlinburg, Tenn., Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE84-011455; CONF-840413-4) Avail: NTIS HC A03/MF A01

The problem of automatic camera tracking of mobile objects is addressed with specific reference to remote manipulators and using either fixed or mobile cameras. The technique uses a kinematic approach employing 4 x 4 coordinate transformation matrices to solve for the needed camera PAN and TILT angles. No vision feedback systems are used, as the required input data are obtained entirely from position sensors from the manipulator and the camera-positioning system. All hardware requirements are generally satisfied by currently available remote manipulator systems with a supervisory computer. The system discussed here implements linear plus on/off (bang-bang) closed-loop control with a +-2(0) deadband. The deadband area is desirable to avoid operator seasickness caused by continuous camera movement. Programming considerations for camera control, including operator interface options, are discussed. The example problem presented is based on an actual implementation using a PDP 11/34 computer, a TeleOperator Systems SM-229 manipulator, and an Oak Ridge National Laboratory (ORNL) camera-positioning system. DOE

N84-31609# Centre Technique des Industries Mecaniques, Senlis (France).
IN SITU GONIOMETER Final Report [GONIOMETRE IN SITU]
P. Barbarin, F. Convert, and B. Miege Dec. 1983 66 p In FRENCH
(CETIM-5.41.22.0) Avail: NTIS HC A04/MF A01

A goniometer for X-ray stress measurement was built. A resistance wire linear detector was used to develop stress measurement programs, even though detector performance is inferior to specification. A tripod goniometer support was designed. Performance tests on large structures are satisfactory.
Author (ESA)

N84-31610# Battelle Inst., Frankfurt am Main (West Germany).
DEVELOPMENT OF A TRANSIMPEDANCE AMPLIFIER FOR CRYOTEMPERATURES, STUDY Final Report, Jul. 1983
Ulrich Brunsmann, Otto Frenzl, Guenter Zimmer (Dortmund Univ., West Germany), and Martin Wrede (Dortmund Univ., West Germany) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 54 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-023; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,50

Design, construction and measured data of three versions of a monolithic transimpedance amplifier for cryotemperatures are described. The amplifier is implemented in Si-gate-CMOS technology and provided with a MOSFET, a process-compatible JFET and an open input. The implemented versions of the amplifier do not reach the simulated operating points because of the shift of the characteristics at cryotemperatures. With respect to power dissipation and noise, it is necessary to redesign the amplifier, in order to fabricate amplifiers suitable for the German infrared observatory GIRL on Spacelab.
Author (ESA)

N84-31611# Brown, Boveri und Cie, A.G., Mannheim (West Germany). Zentrales Labor fuer Elektronik und Datenverarbeitung.
INTELLIGENT INSTRUMENTS FOR PROCESS MEASUREMENT TECHNIQUES (MONITORING OF SENSORS) Final Report, Dec. 1981
Bernd Bauer, Hans-Dieter Hess, Josef Robert Kalinski, Wolfgang Leisenberg (Technische Universitaet, Berlin), and Detlef Marsch (Technische Universitaet, Berlin) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 170 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-078; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33,50

Possibilities to extract redundant information of temperature sensors (resistance thermometers, thermocouples, semiconductor temperature sensors), and to find out which of the suggested redundancies are most suited for self controlled monitoring were investigated. Practical experience with equipment for process measurement techniques shows that sensor failures are five times more frequent than electronic malfunction. For resistance thermometers the measured values of the redundant information source (ac resistance) are too small (relative inductivity change 7 million). The information sources strain gage and propagation of ultrasonic waves are excluded because of physical properties in the sensor materials. Changes in the crystalline structure of thermocouples have the effect that there is no well defined relationship between thermoelectric voltage and the redundant information sources, resistance and coupled current impulses. A correlation of thermovoltage with these redundant values would yield a measurement uncertainty corresponding to more than + or - 50 K. Experiments with negative temperature coefficient sensors show that a failure is proceeded by a change in capacitance of the order of 0.1 pF.
Author (ESA)

N84-31612# Continental Gummi-Werke A.G., Hannover (West Germany).
HOLOGRAPHIC TEST PROCEDURES FOR THE EVALUATION OF COMPLICATED MATERIAL COMPOSITES (TIRES) Final Report, Aug. 1981
Dieter Kassen and Ernst-Uwe Hentschke Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 66 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-096; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

A holographic test procedure for the evaluation of complicated material composites was developed in order to obtain an instrument employable outside the laboratory in rough production environments. In order to evaluate the importance of holographic results for the reliability of tires about 8000 old and new tires were investigated and reliability car and bench tests carried out. Results show that in reliability evaluations careful differentiation must be made with respect to construction and strain of the test specimen. Holographic measuring results convey a comprehensive picture of the condition of the investigated material composite systems.
Author (ESA)

N84-31613# Goettingen Univ. (West Germany). Lehrstuhl fuer Angewandte Mechanik und Stroemungsphysik.
DEVELOPMENT OF A DEVICE FOR EVALUATION OF INTERFEROGRAMS Final Report, May 1981
Friedhelm Becker, Gerd E. A. Meier, and Horst Wegner Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 79 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-097; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West

Germany DM 16,50

For digitizing and processing of the interferograms from classical and holographic interferometers a picture analysis system based upon a computer with a television digitizer was installed. Depending on the quality of the interferograms, four different picture enhancement operations are used: signal averaging, spatial smoothing, subtraction of the overlayed intensity function and the removal of distortion patterns using a spatial filtering technique in the frequency spectrum of the interferograms. The extraction of fringe loci from the digitized interferograms is performed by a floating threshold method. The fringes are numbered using a special scheme after the removal of any fringe disconnections which appear if there is insifficient contrast in the holograms. The reconstruction of the object function from the fringe field is achieved by a local polynomial least squares approximation with spline fit. Author (ESA)

N84-31614# AEG-Telefunken, Frankfurt am Main (West Germany). Forschungsinst.
CRYSTALLINE PHOTOCONDUCTIVE FILMS FOR ELECTROPHOTOGRAPHIC RECORDING Final Report, Jul. 1981
Norbert Marshall, Doris Martini, Wilhelm Senske, Wolfgang Woest, and Manfred Lutz Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-099; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Crystalline photoconductive films of mixed crystal materials Cd1-xZnx5 and Cd51-y Sey were developed for electrophotographic plates with high charging voltages. Film growth is performed by sputter deposition, which allows growing of homogeneous films with low dark decay combined with high photoelectric gain and nearly vanishing residual potential. Panchromatic sensitivity is achieved for the largest part of the visible range, depending on the choice of material composition. An increase in the number of copies per drum is expected due to the high thermal and mechanical stability of the material. Remarkable enhancement of spatial resolution of the copies is expected due to the high charging voltages at reduced film thickness. Author (ESA)

N84-31149# Test Systems, Inc., Phoenix, Ariz.
MIL-STD-1553: TESTING AND TEST EQUIPMENT
L. Earhart *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 349-365 (For primary document see N84-31121 21-06)
(AD-P003545) Avail: NTIS HC A25/MF A01 CSCL 14/2

N84-31192# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MATE STANDARDIZATION
R. E. Farmer *In its* Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1005-1012 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003587) Avail: NTIS HC A25/MF A01 CSCL 14/2

N84-32038# Tokyo Denki Univ. (Japan).
EFFECT OF THERMAL IRRADIATION FROM EVAPORATION SOURCE TO PHOTO-DARKENING SENSITIVITY OF VACUUM DEPOSITED AgBr FILM
Yoichi Abe *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 35-42 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32068# Joint Publications Research Service, Arlington, Va.
APPARATUS BASED ON HOLOGRAPHIC FOCUSING DIFFRACTION GRATING FOR MEASUREMENT OF DIFFRACTION EFFICIENCY OF THREE-DIMENSIONAL IMAGE HOLOGRAMS Abstract Only
T. N. Paramonova and Yu. N. Denisyuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 81 Transl. into ENGLISH from Optika i Spektroskopiya (Leningrad), v. 55, no. 6, Jun. 1983 p 1048-1052 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32107# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL EQUATIONS FOR MOVEMENT OF TRIAXIAL GYROSCOPIC STABILIZER ON MOVING BASE Abstract Only
V. S. Antonchik and I. I. Romanyuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 84 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 59-63 Original language document previously announced in IAA as A84-25614 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-31615 Texas A&M Univ., College Station.
A STUDY OF A TWO-FREQUENCY NMR MASER Ph.D. Thesis
Jack Edward Tatum 1983 104 p
Avail: Univ. Microfilms Order No. DA8408487

A unique NMR maser was developed and operated which oscillates continuously and simultaneously at two different Larmor frequencies. The nuclear spin systems consist of hydrogen and fluorine nuclei provided by a 10 cubic cm. sample of benzene and hexafluorobenzene. Overhauser pumping is used to invert and enhance the two nuclear magnetizations. A magnetic field of 11.74 gauss is used so that the oscillation frequencies are 50.00 kHz (the hydrogen nuclei Larmor frequency at 11.74 g) and 47.04 kHz (the fluorine nuclei Larmor frequency). The oscillations occur in a tuned circuit which resonates at the two frequencies. The frequency stability as a function of averaging time of the maser was measured by a period counting technique which uses one oscillation frequency as a clock against which the other oscillation frequency is determined. This method is shown by yield (in principle) the stability that would be directly measured (using a perfect clock) for the maser operating in an absolutely constant magnetic field. Dissert. Abstr.

N84-31616*# Hampton Inst., Va. Dept. of Physics and Engineering Studies.
STUDIES OF NEW MEDIA RADIATION INDUCED LASER Final Report, 1 Feb. 1979 - 30 Apr. 1984
K. S. Han, Y. J. Shiu, S. R. Raju, I. H. Hwang, and B. Tabibi Jun. 1984 81 p refs
(Grant NsG-1595)
(NASA-CR-173846; NAS 1.26:173846) Avail: NTIS HC A05/MF A01 CSCL 20E

Various lasants were investigated especially, 2-iodohepafluoropropane (i-C3F7I) for the direct solar pumped lasers. Optical pumping of iodine laser was achieved using a small flashlamp. Using i-C3F7I as a laser gain medium, threshold inversion density, small signal gain, and laser performance at the elevated temperature were measured. The experimental results and analysis are presented. The iodine laser kinetics of the C3F7I and IBr system were numerically simulated. The concept of a direct solar-pumped laser amplifier using (i-C3F7I) as the laser material was evaluated and several kinetic coefficients for i-C3F7I laser system were reexamined. The results are discussed. A.R.H.

N84-31617*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A BLACKBODY-PUMPED CO2-N2 TRANSFER LASER
R. J. DeYoung and N. S. Higdon Aug. 1984 12 p refs
(NASA-TP-2347; L-15753; NAS 1.60:2347) Avail: NTIS HC A02/MF A01 CSCL 20E

A compact blackbody-pumped CO2-N2 transfer laser was constructed and the significant operating parameters were investigated. Lasing was achieved at 10.6 microns by passing

preheated N2 through a 1.5-mm-diameter nozzle to a laser cavity where the N2 was mixed with CO2 and He. An intrinsic efficiency of 0.7 percent was achieved for an oven temperature of 1473 K and N2 oven pressure of 440 torr. The optimum laser cavity consisted of a back mirror with maximum reflectivity and an output mirror with 97.5-percent reflectivity. The optimum gas mixture was 1CO2/.5He/6N2. The variation of laser output was measured as a function of oven temperature, nozzle diameter, N2 oven pressure, He and CO2 partial pressures, nozzle-to-oven separation, laser cell temperature, and output laser mirror reflectivity. With these parameters optimized, outputs approaching 1.4 watts were achieved. Author

N84-31618# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NONLINEAR THEORY OF THE FREE-ELECTRON LASER
Abraham Cian-Long Chian and Antonio de Padua Brito Serbeto Jul. 1984 12 p refs Presented at the 4th Simp. Nipo-Brasileiro de Cienc. e Tecnol., Sao Paulo, 7-9 Aug. 1984
(INPE-3193-PRE/557) Avail: NTIS HC A02/MF A01

A theory of Raman free electron laser using a circularly polarized electromagnetic pump is investigated. Coupled wave equations that described both linear and nonlinear evolution of stimulated Raman scattering are derived. The dispersion relation and the growth rate for the parametric instability are obtained. Nonlinear processes that may lead to saturation of the free-electron laser are discussed. Author

N84-31619*# Westinghouse Electric Corp., Pittsburgh, Pa.
LASER-ASSISTED SOLAR CELL METALLIZATION PROCESSING
S. Dutta 3 Apr. 1984 29 p Prepared for JPL
(Contracts NAS7-100; JPL-956615)
(NASA-CR-173875; DOE/JPL-956615-84/2; NAS 1.26:173875; DE84-011003) Avail: NTIS HC A03/MF A01 CSCL 20E

Metal deposition experiments were carried out utilizing laser assisted pyrolysis of a variety of metal bearing polymer films and metallo-organic inks spun onto silicon substrates. Laser decomposition of spun on silver neodecanoate ink was programmed. Solar cell comb metallization patterns were written using this technique, each pattern being written in a fraction of a second. DOE

N84-31620# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLOWING EFFECTS IN GAS LASERS
G. Zhi 10 May 1984 10 p Transl. into ENGLISH from Lixue Xuebao (China), no. 3, May 1981 p 300-303
(AD-A141409; FTD-ID(RS)T-0283-84) Avail: NTIS HC A02/MF A01 CSCL 20/5

Currently accepted theory states that saturation intensity and gain (or optical power density) increase without limit with the increase of the flow speed. These conclusions are not true. It is shown instead that they tend to be limiting values with the increase of flow speed. The variations of the parameters mentioned above with flow speed are presented. R.J.F.

N84-31621# California Univ., Los Angeles. Dept. of Electrical Engineering.
Nd-3+ BETA PRIME PRIME ALUMINA PLATELET LASER
M. Jansen, A. Alfrey, O. M. Stafsudd, B. Dunn, D. L. Yang, and G. C. Farrington (Pennsylvania Univ., Philadelphia) May 1984 19 p
(Contract N00014-83-K-0498)
(AD-A142797; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/5

Pulsed as well as CW laser action has been observed in a new host material for Nd3+ ions, Na+ beta alumina. The unusual characteristics of the material and its known physical properties are briefly described. Absorption spectra, fluorescence lifetime, laser-pulse shape, and peak emission wavelength are presented as experimental evidence, and comparisons are made with other Nd3+ host materials. Some exciting new possibilities for integrated-optics applications are explored. Author (GRA)

N84-31622# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TIME-DEPENDENT OSCILLATIONS IN A CW HF CHEMICAL LASER UNSTABLE RESONATOR M.S. Thesis
S. W. Towsend 1984 69 p
(AD-A142966; AFIT/CI/NR-84-28T) Avail: NTIS HC A04/MF A01 CSCL 20/5

The multi-line performance of a CW HF chemical laser was measured as a function of the SF6 and H2 flow rates, pressure and resonator type. The Blase II and MNORO3 CW chemical laser computer codes gave reasonable agreement with the experimental data as the flow rates and pressure were varied. Total power and beam diameter increased as the pressure decreased. The data indicate the occurrence of a near resonant energy transfer from v=2, J=3, 4 to v=2, J=14 with a subsequent rotational cascade to v=2, J=11. The amplitude, frequency and Fresnel number dependence of the time-dependent oscillations which were predicted to occur on lines whose saturated gain does not fill the unstable resonator were measured. The time-dependent oscillations which had a period of about 40 ns independent of flow rates, do not occur for Fresnel numbers less than 1.5 and their amplitudes increased as the fraction of the resonator filled by the saturated gain of the oscillating line decreased. GRA

N84-31623# Columbia Univ., New York. Plasma Physics Lab.
THOMSON BACKSCATTERING FROM AN INTENSE RELATIVISTIC ELECTRON BEAM AS A DIAGNOSTIC FOR A FREE ELECTRON LASER Interim Report
S. C. Chen and T. C. Marshall Apr. 1984 113 p
(Contract N00014-79-C-0769; RR0-1107)
(AD-A143027; Rept-95) Avail: NTIS HC A06/MF A01 CSCL 20/5

The parallel momentum spread of an intense relativistic electron beam (1 KA/CC, 700 KV) used in a Raman free electron laser, is determined by a Thomson backscattering experiment. Theory is reviewed to show that the relativistic effect combines with the backscattering geometry to provide maximum energy resolution, sensitivity, and scattered signal level for the energy diagnostic experiment. The electron beam is field-emitted from a cold cathode, apertured by the anode, and guided by a 9.5 KG magnetic field to scatter the 20 MW peak power, mode-locked 9.6 micrometer CO2-laser radiation. The electron beam is found to have adequate qualities for Raman free electron laser applications: A normalized beam energy spread of (0.6 + or - 0.14) % is obtained from the frequency-upshifted backscattered spectrum centered at 0.5 micrometer. It is also found that the use of the 1.7 cm period radially dependent undulator field introduces extra inhomogeneous broadening on the electron beam -- the momentum spread increases monotonically with the undulator field strength.
Author (GRA)

N84-31624# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
RESONANCE IONIZATION SPECTROPSCOPY MEASUREMENT OF THE VAPOR PRESSURE OF SEVERAL MOLECULAR SPECIES
G. A. Capelle, D. Jessup, H. M. Borella, and L. A. Franks 1984 18 p refs Presented at 2nd Symp. on Resonance Spectry. and its Appl., Knoxville, Tenn., 16 Apr. 1984
(Contract DE-AC08-83NV-10282)
(DE84-010656; CONF-840449-1) Avail: NTIS HC A02/MF A01

In recent years resonance ionization spectroscopy (RIS) has found increasing application to various problems involving detection of low levels of atomic, and more recently molecular, species. This work demonstrates the usefulness of RIS in measuring vapor pressure curves of molecular species at very low pressures. Specifically, the vapor pressures versus temperature relationship for rubidium iodide (RbI) and potassium iodide (KI) was measured by applying RIS to atomic Rb and K, using a two-laser system. A pulsed molecular nitrogen laser first dissociated the RbI to produce ground-state Rb atoms in the experimental cell. A flashlamp-pumped dye laser then ionized the Rb in a process wherein two photons of the same wavelength are absorbed, the first exciting

Rb via an allowed transition to an upper state (5(2)S/sub 1/2/ (YIELDS) 6(2)/sub 1/2 or 3/2/) lying in energy slightly more than half the distance to the ionization limit, and the second photon ionizing the excited Rb. In the case of KI, an excimer-laser-pumped dye laser was used in a similar way. DOE

N84-31625# Department of Energy, Washington, D. C.
LASER WINDOW WITH ANNULAR GROOVES FOR THERMAL ISOLATION Patent Application
Bruce E. Warner, James A. Horton, and Terry W. Alger, inventors (to DOE) Filed 13 Jul. 1983 18 p
(Contract W-7405-eng-48)
(DE84-011114; US-Patent-Appl-513521) Avail: NTIS HC A02/MF A01

A laser window or other optical element which is thermally loaded, heats up and causes optical distortions because of temperature gradients between the center and the edge. A number of annual grooves, one to three or more, are formed in the element between a central portion and edge portion, producing a web portion which concentrates the thermal gradient and thermally isolates the central portion from the edge portion, producing a uniform temperature profile across the central portion and therefore reduce the optical distortions. The grooves are narrow and closely spaced with respect to the thickness of the element, and successive grooves are formed from alternate sides of the element. NASA

N84-31626# California Univ., Berkeley. Lawrence Berkeley Lab.
SHORT WAVELENGTH OPTICS FOR FUTURE FREE ELECTRON LASERS
D. T. Attwood Apr. 1984 22 p refs Presented at Topical Meeting on Free Electron Generation of Extreme Ultraviolet Coherent Radiation, Upton, N.Y., 19 Sep. 1983
(Contract DE-AC03-76SF-00098)
(DE84-012316; LBL-17775; CONF-8309118-10) Avail: NTIS HC A02/MF A01

The study of free electron lasers for use on sufficient single pass gain is outlined, the availability of mirrors of high reflectance, however, for the vacuum ultraviolet and soft X-ray regime make resonant cavities a possibility. As in ordinary synchrotron radiation work, mirrors are required for the construction of realistic experiments and for beam manipulation purposes such as folding and extraction. A number of approaches to reflecting optics for free electron lasers, which are summarized. DOE

N84-31627# California Univ., Livermore. Lawrence Livermore Lab.
SOFT X-RAY LASER EXPERIMENTS AT NORVETTE LASER FACILITY
D. Matthews, P. Hagelstein, M. Rosen, R. Kauffman, R. Lee, C. Wang, H. Medecki, N. Ceglio, and G. Leipelt 5 Mar. 1984 22 p refs Presented at 2nd topical Meeting on Laser Tech. in the Extreme Ultraviolet, Boulder, Colo., 5 Mar. 1984
(Contract W-7405-eng-48)
(DE84-012594; UCRL-90334; CONF-840387) Avail: NTIS HC A02/MF A01

Experiments to study the possibility of producing an X ray laser are examined. The investigated designs are all pumped by the Novette Laser, operated at short pulse (tau/sub L/ approx. 100 psec) and an incident wavelength of lambda /sub L/ approx. 0.53 (MU)m. The possibility of lasing at 53.6, 68.0 to 72.0, 119.0, and 153.0 eV, is studied using the the inversion methods of resonant photo excitation, collisional excitation, and three body recombination. DOE

N84-31628# California Univ., Livermore. Lawrence Livermore Lab.
DIAGNOSTICS FOR AN XUV/SOFT X-RAY LASER
R. L. Kauffman, D. L. Matthews, N. Caglio, and H. Medecki 3 Mar. 1984 9 p refs Presented at 2nd Topical Meeting on Laser Tech. in the Extreme Ultraviolet, Boulder, Colo., 5 Mar. 1984
(Contract W-7405-eng-48)
(DE84-012593; UCRL-90335; CONF-840387-9) Avail: NTIS HC A02/MF A01

The production of an XUV/soft X-ray laser is investigated using high powered glass lasers as drivers. A major diagnostic for lasing is the measure of the absolute power produced in the lasing line. A spectrograph of time resolved lasing lines in the energy range from 50 eV to greater than 200 eV is developed. The spectrograph combines a transmission grating and X ray streak camera to produce a flat field instrument. A cylindrical mirror is used in front of the grating to image the source and act as a collecting optic. The efficiency of the components is calibrated so that absolute intensities can be measured. The performance of this instrument is compared with reflection grating systems. Planned improvements to the system which should increase total throughput, image quality, and resolving power are discussed. DOE

N84-31629# Pacific Northwest Lab., Richland, Wash.
OPTICAL COATING MATERIALS FOR THE ULTRAVIOLET: SELECTION AND CHARACTERIZATION
W. T. Pawlewicz Apr. 1984 6 p refs Presented at the SPIE Tech. East 1984 Symp., Arlington, Va., 1-2 May 1984
(Contract DE-AC06-76RL-01830)
(DE84-011504; PNL-SA-12218; CONF-8405158-1) Avail: NTIS HC A02/MF A01

Experiences at Pacific Northwest Laboratory in the selection, deposition and characterization of oxide optical coatings for use with excimer lasers are reviewed. Fabrication results for all-dielectric high reflectors at 248 and 308 nm are presented. Glassy or amorphous coating materials such as SiO2 and Ta2O5 appear to be more promising for ultraviolet use than polycrystalline materials such as Y2O3, Al2O3, ZrO2 and HfO2 because of reduced surface roughness. Glassy materials, formed by ion bombardment or by mixing oxides appear to be a promising direction for future ultraviolet coating development. DOE

N84-31630# Oak Ridge National Lab., Tenn. Chemical Physics Section.
THEORY OF 4-WAVE MIXING FOR VUV GENERATION
M. G. Payne, W. R. Garrett, and W. R. Ferrell Apr. 1984 11 p refs Presented at the 2nd Symp. on Resonance Ionization Spectry. and its Appl., Knoxville, Tenn., 16-20 Apr. 1984 Sponsored in part by Martin Marietta Energy Systems, Inc.
(Contract DE-AC05-84OR-21400)
(DE84-011663; CONF-840449-6) Avail: NTIS HC A02/MF A01

The physical phenomenon involved in four wave mixing or third harmonic generation in gas phase media is presented. The system involves unfocused, plane polarized light from two lasers passing through a gas cell containing an active gas and a buffer gas. DOE

N84-31631# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF A MULTIDETECTOR DEFLECTION MEASUREMENT SYSTEM Final Report, Sep. 1982 - Aug. 1983
H. D. Bissinger and W. L. Robinson 10 Apr. 1984 73 p refs
(Contract W-7405-eng-48)
(DE84-013580; UCRL-53509) Avail: NTIS HC A04/MF A01

Work on the LABAN Laser Optical Line of Sight (LOLOS) project is prepared. The technical portion of the development, which includes the final design, key calculations, an error budget analysis, environmental test results, and a summary noting critical technical issues is presented. DOE

N84-31632# Los Alamos Scientific Lab., N. Mex.
OPERATIONAL PERFORMANCE OF THE ANTARES ALIGNMENT SYSTEM
Steven C. Bender and Quentin D. Appert 1984 8 p refs Presented at the SPIE Tech. Symp. East '84, Arlington, Va., 29 Apr. - 1 May 1984
(Contract W-7405-eng-36)
(DE84-012659; LA-UR-84-1415; CONF-8404124-7) Avail: NTIS HC A02/MF A01

A review of the operational performance of the alignment system for the large Antares optical system is presented. The alignment of twenty-four optical channels consisting of two hundred

optical elements is verified and established as required prior to each target shot for this CO2 laser fusion test facility. The overall system design included features such as automatic operation, data base driven controls, self calibration, provisions for initial optical alignment set up, and system aided fault location. The system approach employed two alignment stations which sequentially viewed the 24 optical channels (sectors) and could be used for prealignments and calibrations. Closed-loop operations via the computer permit rapid mirror alignments. The performance of the applied techniques and devices is evaluated and compared to the required performance specifically from the standpoint of accuracy and shot rate. Overall system performance with verification by actual target shots is presented. DOE

N84-31633# Heil (Rudolph), Kiel (West Germany). Entwicklungsbereich Reproduktionstechnik.
LASER COLOR RECORDING UNIT Final Report, Aug. 1982 Eggert Jung Bonn Bundesministerium fuer Forschung und Technologie May 1984 51 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-098; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

A color recording unit was designed for output and control of digitized picture data within computer controlled reproduction and picture processing systems. In order to get a color proof picture of high quality similar to a color print, together with reduced time and material consumption, a photographic color film material was exposed pixelwise by modulated laser beams of three wavelengths for red, green and blue light. Components of different manufacturers for lasers, acousto-optic modulators and polygon mirrors were tested, also different recording methods as (continuous tone mode or screened mode and with a drum or flatbed recording principle). Besides the application for the graphic arts - the proof recorder CPR 403 with continuous tone color recording with a drum scanner - such a color hardcopy peripheral unit with large picture formats and high resolution can be used in medicine, communication, and satellite picture processing. Author (ESA)

N84-31452# Joint Publications Research Service, Arlington, Va.
ALIGNMENT OF MULTISTATE LASER AMPLIFIERS WITH PERIODIC SPACE FILTRATION OF BEAM Abstract only
V. N. Alekseyev, N. V. Nikitin, A. V. Charukhchev, and V. N. Chernov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 55 Transl. into ENGLISH from Optiko-Mekhan. Promyshlennost (Leningrad), no. 11, Nov. 1983 p 46-48 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31922# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SOME ASPECTS OF MECHANISM OF ACTION OF HELIUM-NEON LASER Abstract Only
S. M. Zubkova, Z. A. Sokolova, V. I. Popov, and I. B. Laprun *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 40 Transl. into ENGLISH from Vop. Kurortol. Fiziolter. i Lech. Fiz. Kul. (Moscow), no. 6, Nov.-Dec. 1983 p 25-29 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-32047# Joint Publications Research Service, Arlington, Va.
RELATION BETWEEN PRESSURE PULSE GENERATED IN OPTOACOUSTIC RECEIVER AND INTENSITY OF STIMULATING LASER PULSE Abstract Only
Yu. N. Ponomarev, S. B. Ponomareva, and B. A. Tikhomirov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 13-14 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 26, no. 11, Nov. 1983 p 8-11 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32065# Joint Publications Research Service, Arlington, Va.
IMPROVING ENERGY PERFORMANCE AND DUTY TIME OF PRODUCTION PROCESS CW ELECTRICAL IONIZATION CO2 LASERS BY USING FIVE-COMPONENT LASING MIXTURES Abstract Only
A. P. Averin, N. G. Basov, Ye. P. Glotov, V. A. Danilychev, O. M. Kerimov, M. M. Malysh, A. M. Soroka, V. Ye. Tsepelev, and N. V. Cheburkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 60 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 20, 26 Oct. 1983 p 1224-1228 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32066# Joint Publications Research Service, Arlington, Va.
IRIS PULSING RUBY LIGHT SOURCE Abstract Only
Yu. F. Morgun, M. A. Muravitskiy, and L. A. Lavrosvkiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 34, no. 4, Oct. 1983 p 684-687 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32067# Joint Publications Research Service, Arlington, Va.
NEW TYPE OF DYE LASER WITH LIGHT-INDUCED DISTRIBUTED FEEDBACK Abstract Only
A. D. Dasko, A. A. Muravyev, A. N. Rubinov, S. A. Ryzhechkin, and T. Sh. Efendiyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 70 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 47, no. 12, Dec. 1983 p 2408-2414 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32070# Joint Publications Research Service, Arlington, Va.
SOURCE OF OPTICAL PUMPING FOR HIGH-RESOLUTION SPECTROSCOPY WITH SEMICONDUCTOR LASER Abstract Only
L. A. Budkin, O. G. Okhotnikov, G. T. Pak, A. I. Pikhtelev, and S. L. Puzanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 92 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 1, Jan. 1984 p 165-167 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32072# Joint Publications Research Service, Arlington, Va.
DOUBLE SCATTERING BACKGROUND IN A CW LIDAR Abstract Only
A. V. Sinyavskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 111 Transl. into ENGLISH from Izv. Akad. Nauk Armyanskoy SSR: Fiz. (Yerevan, USSR), v. 18, no. 5, Sep. - Oct. 1983 p 291-295 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32093# Joint Publications Research Service, Arlington, Va.
CHEMICAL LASERS
Yu. Khariton *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 34-35 Transl. into ENGLISH from Pravda (Moscow), 12 Mar. 1984 p 3 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32094# Joint Publications Research Service, Arlington, Va.
STUDY OF EMISSION SPECTRUM OF TEA CO2 LASERS WITH INTRACAVITY ABSORBER Abstract Only
A. B. Vasilyev and A. I. Fedoseyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 38 Transl. into ENGLISH from Vestn. Mosk. Univ.: Ser. 3 Fiz. Astron. (Moscow), v. 24, no. 4, Jul. - Aug. 1983 p 62-64 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32095# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS IN DEVELOPMENT OF POWERFUL DYE LASER Abstract Only
G. N. Alferov, V. I. Donin, and G. G. Telegin *In its* USSR Rept.:

Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 42 Transl. into ENGLISH from Avtometriya (Novosibirsk, USSR), no. 1, Jan. - Feb. 1984 p 82-85 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32096# Joint Publications Research Service, Arlington, Va.
MULTIFREQUENCY EMISSION FROM SUBMILLIMETER LASERS Abstract Only
Yu. Ye. Kamenev, Ye. M. Kuleshov, and A. N. Lebedenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 45-46 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 213-214 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32097# Joint Publications Research Service, Arlington, Va.
PICOSECOND PARAMETRIC OPTICAL OSCILLATOR WITH AMPLIFICATION OF RADIATION FROM TUNABLE SEMICONDUCTOR LASER Abstract Only
V. L. Boychenko, I. I. Zasavitskiy, Yu. V. Kosichkin, A. P. Tarasevich, V. G. Tunkin, and A. P. Shotov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 46-47 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 203-205 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32098# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE CO2 LASER WITH 7.5 W POWER RATING Abstract Only
A. Ye. Belyanko, N. I. Lipatov, P. P. Pashinin, Yu. N. Polivanov, A. M. Prokhorov, V. V. Sakhanova, and V. Yu. Yurov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 48 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 184-187 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32248# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
A LASER IMAGE GENERATION SYSTEM FOR HELICOPTER NAP-OF-THE-EARTH (NOE) FLIGHT TRAINING
H. M. Tong *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 253-261 (For primary document see N84-32223 21-81)
(AD-P003481) Avail: NTIS HC A17/MF A01 CSCL 05/9

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-31634*# Arizona Univ., Tucson. Optical Sciences Center.
DOUBLE ARCH MIRROR STUDY. PART 1: PRELIMINARY ENGINEERING REPORT Final Report
Daniel Vukobratovich and Don Hillman Mar. 1983 44 p refs 4 Vol.
(Grant NAG2-220)
(NASA-CR-166589-Pt-1; NAS 1.26:166589-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 13I

In the proposed design, the NASA AMES 20-in double arch mirror is supported by three clamp and flexure assemblies. The mirror clamp consists of a T-shaped Invar-36 member that goes into a similarly shaped socket in the back of the mirror. The mirror socket is made oversize and contacts the clamp only along the conical surface. The clamp is preloaded by a spring washer and pulls the mirror into contact with the flexure. The clamp is then inserted into the mirror socket through a cutout, is rotated 90 deg, and is then pinned in place. Loading conditions considered in socket design are discussed as well as stress in the socket and clamp. Flexure geometry and stress are examined as well as the effects of flexure error and of mirror cell error. A.R.H.

N84-31635*# Arizona Univ., Tucson. Optical Sciences Center.
DOUBLE ARCH MIRROR STUDY. PART 2: ENGINEERING ANALYSIS REPORT Final Report, Apr. - May 1983
Bijan Iraninejad and Daniel Vukobratovich May 1983 66 p refs 4 Vol.
(Grant NAG2-220)
(NASA-CR-166589-Pt-2; NAS 1.26:166589-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 13I

A method of mounting a cryogenically cooled, lightweight, double arch, class mirror for infrared, astronomical telescopes was developed. A 50 cm, fused silica mirror was modified for use in a new mount configuration. The flexures and the finite element analysis of the mirror stresses are reported. E.A.K.

N84-31636*# Arizona Univ., Tucson. Optical Sciences Center.
DOUBLE ARCH MIRROR STUDY. PART 3: FABRICATION AND TEST REPORT Final Report, Jun. - Nov. 1983
Daniel Vukobratovich and Don Hillman Nov. 1983 49 p refs 4 Vol.
(Grant NAG2-220)
(NASA-CR-166589-Pt-3; NAS 1.26:166589-Pt-3) Avail: NTIS HC A03/MF A01 CSCL 13I

A method of mounting a cryogenically cooled, lightweight, double arch, glass mirror was developed for infrared, astronomical telescopes such as the Space Infrared Telescope Facility (SIRTF). A 50 cm, fused silica mirror which was previously fabricated was modified for use with a new mount configuration. This mount concept was developed. The modification of the mirror, the fabrication of the mirror mount, and the room temperature testing of the mounted mirror are reported. A design for a SIRTF class primary mirror is suggested. E.A.K.

N84-31637*# Arizona Univ., Tucson. Optical Sciences Center.
DOUBLE ARCH MIRROR STUDY Final Report
Daniel Vukobratovich and Don Hillman Nov. 1983 49 p refs 4 Vol.
(Grant NAG2-220)
(NASA-CR-166589; NAS 1.26:166589) Avail: NTIS HC A03/MF A01 CSCL 13I

The development of a method of mounting light weight glass mirrors for astronomical telescopes compatible with the goals of the Shuttle Infrared Telescope Facility (SIRTF) was investigated. A 20 in. diameter double arch lightweight mirror previously fabricated was modified to use a new mount configuration. This mount concept was developed and fabricated. The mounting concept of the double mounting mirror is outlined. The modifications made to the mirror, fabrication of the mirror mount, and room temperature testing of the mirror and mount and the extension of the mirror and mount concept to a full size (40 in. diameter) primary mirror for SIRTF are discussed. E.A.K.

N84-31638*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RADIAL SI LATCHES VIBRATION TEST DATA REVIEW
Phillip M. Harrison and James Lee Smith Jul. 1984 67 p
(NASA-TM-86454; NAS 1.15:86454) Avail: NTIS HC A04/MF A01 CSCL 13I

Dynamic testing of the Space Telescope Scientific Instrument Radial Latches was performed as specified by the designated test criteria. No structural failures were observed during the test. The alignment stability of the instrument simulator was within required tolerances after testing. Particulates were discovered around the latch bases, after testing, due to wearing at the B and C latch interface surfaces. This report covers criteria derivation, testing, and test results. Author

N84-31639*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TESTING AND EVALUATION OF VESPEL UP TO 450 DEG F WHEN USED IN NUTS AND BOLTS AS A SELF-LOCKING ELEMENT
Carl M. Wood Aug. 1984 43 p
(NASA-TM-86456; NAS 1.15:86456) Avail: NTIS

HC A03/MF A01 CSCL 13I

The object of this investigation was to evaluate Vespel for potential application on the Solid Rocket Booster to replace all-metal deformed self-locking nuts and anchor nuts and be used as self-locking elements for bolts and screws. The Vespel self-locking elements were tested for prevailing torque retention at room temperature, after heating to 450 F and exposure for 3 hr, breakaway torque at 450 F and for vibration at a level consistent with the maximum expected on the SRB at lift-off and reentry. The investigation revealed Vespel has properties that can provide a self-locking capability for threaded fasteners up to 450 F and it can be used in nuts and anchor nuts for installation on the SRB. Vespel elements in bolts did not meet all our SRB requirements for reuse, however, we have defined a design for Vespel elements in nuts/anchor nuts that fully meets all requirements. It is recommended that No. 1, 1/4 in. and 5/16 in. nuts/anchor nuts be procured for use on the SRB. This system will eliminate the galling problems now encountered and achieve a much higher reuse life than the present deformed nut design. Author

N84-31640*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LUBRICATION OF MACHINE ELEMENTS

Bernard J. Hamrock Aug. 1984 92 p refs Submitted for publication

(NASA-RP-1126; E-1949; NAS 1.61:1126) Avail: NTIS HC A05/MF A01 CSCL 13I

The understanding of hydrodynamic lubrication began with the classical experiments of Tower and Petrov. Reynolds used a reduced form of the Navier-Stokes equations and the continuity equation to generate a second order differential equation for the pressure in the narrow, converging gap of a bearing contact. Such a pressure enables a load to be transmitted between the surfaces with very low friction since the surfaces are completely separated by a film of fluid. In such a situation it is the physical properties of the lubricant, notably the dynamic viscosity, that dictate the behavior of the contact. The understanding of boundary lubrication is normally attributed to Hardy and Doubleday. In boundary lubrication it is the physical and chemical properties of thin films of molecular proportions and the surfaces to which they are attached that determine contact behavior. The lubricant viscosity is not an influential parameter. Research is devoted to a better understanding and more precise definition of other lubrication regimes between these extremes. One such regime, elastohydrodynamic lubrication, occurs in nonconformal contacts, where the pressures are high and the bearing surfaces deform elastically. In this situation the viscosity of the lubricant may raise considerably, and this further assists the formation of an effective fluid film. The science of these three lubrication regimes (hydrodynamic, elastohydrodynamic, and boundary) are described and the manner in which this science is used in the design of machine elements is examined. M.A.C.

N84-31641*# Cummins Engine Co., Inc., Columbus, Ind.

POSITIVE DISPLACEMENT COMPOUNDING OF A HEAVY DUTY DIESEL ENGINE Contractor Final Report

Raj Sekar and Roy Kamo Nov. 1983 104 p refs Sponsored in cooperation with NASA. Lewis Research Center

(Contract DE-AC02-78CS-54936)

(NASA-CR-168286; DOE/NASA-4936/3; NAS 1.26:168286; CTR-0748-84003) Avail: NTIS HC A06/MF A01 CSCL 20A

A helical screw type positive displacement (PD) compressor and expander was considered as an alternative to the turbocharger and the power turbine in the Cummins advanced turbocompound engine. The Institute of Gas Technology (IGT) completed the design, layout, and performance prediction of the PD machines. The results indicate that a screw compressor-expander system is feasible up to at least 750 HP, dry operation of the rotors is feasible, cost and producibility are uncertain, and the system will yield about 4% improvement in brake specific fuel consumption (BSFC) over the advanced turbocompound engine. Author

N84-31642# Army Research and Development Lab., Fort Belvoir, Va.

STATUS OF THE DEVELOPMENT OF A LONG-LIFE ENGINE COOLANT SYSTEM Interim Report

J. H. Conley and C. I. Collins Nov. 1983 17 p

(DA Proj. 1L7-62733-AH-20)

(AD-A143098; BRDC-2392) Avail: NTIS HC A02/MF A01 CSCL 13/6

The objective of this study is to evaluate two prototype long-life coolant systems in actual vehicle tests. The systems utilize an electronic coolant condition sensor in conjunction with either the newly developed MIL-A-53009 Extender Additive or a commercial spin-on filter/conditioner unit. Both systems were started with an antifreeze with a partially depleted inhibitor system. Results show that, to date, there has been no apparent depletion of the additive systems in either vehicle, and the sensors are functioning properly. Author (GRA)

N84-31643# Department of the Army, Washington, D. C.

RETRACTABLE TIE-DOWN DEVICE Patent Application

D. L. Hemmings, inventor (to Army) Filed 4 Jun. 1984 16 p

(AD-D011079; US-Patent-Appl-SN-616632) Avail: NTIS HC A02/MF A01 CSCL 13/5

An improved storable tie-down device. The tie-down device has a center bar with a pair of spared, parallel V-shaped arms extending from the center bar. A mounting arm extends outward from the V-shaped legs. A housing located below the surface of a frame holds the mounting arms so that the tie-down device can be rotated from a retracted storage position to an active attachment position. Author (GRA)

N84-31644# Department of the Army, Washington, D. C.

SHAFT COUPLING DEVICE Patent Application

E. F. Geppert, inventor (to Army) Filed 13 Jun. 1984 12 p

(AD-D011080; US-Patent-Appl-SN-620301) Avail: NTIS HC A02/MF A01 CSCL 13/5

One strong coupling which also requires a minimum amount of access space includes first and second shafts. One shaft is connected to a source of power and the second shaft is connected to the output to be driven. The shafts have cylindrical bores with a plurality of longitudinal extending channels formed along the interior bores formed in the ends juxtaposed each other. The channels of the bores are in a one to one correspondence. A sliding core is disposed within the chamber formed by the bores, the core having a plurality of longitudinal splines extending radially outward. The splines have a one to one correspondence with the channels and are adapted to engage the channels within each bore so when the sliding core bridges the space between the shafts, the shafts are coupled for rotation. Adjustment means are associated with the core to move it from a first engaged position where it bridges and connects the shafts to a second disengaged position where the core is contained fully within the bore of one shaft so that the shafts are uncoupled. Author (GRA)

N84-31645# Hanford Engineering Development Lab., Richland, Wash.

MICROPROCESSOR ENHANCED REAL TIME MANUAL CONTROL OF AN INDUSTRIAL ROBOT

J. A. Yount and R. H. Phillips (Illinois Univ., Chicago) 14 Sep. 1983 12 p refs Presented at the Robots 8 Conf., Detroit, 4-7 Jun. 1984

(Contract DE-AC06-76FF-02170)

(DE84-011805; HEDL-SA-3014FP; CONF-8406126-1) Avail: NTIS HC A02/MF A01

Remote handling using commercial robotic devices is a viable approach for manipulating hazardous materials. However, these operations can result in unforeseen situations that require interruption of a robot program, followed by manual adjustment to the path and subsequent resumption of program control. A microcomputer and precision joystick controller interfaced with the control unit of the robot provide an effective means of achieving this from a remote location. Ongoing collaborative research between Westinghouse Hanford Company and the Robotics and Automation

Laboratory of the University of Illinois at Chicago for achieving such control from a remote location is described. The approach being used to achieve real time control from a remote location and a microcomputer based system that was constructed for a Cincinnati Milacron T3 hydraulic robot is discussed. DOE

N84-31646# Oak Ridge National Lab., Tenn. Engineering Div.
ADVANCED REMOTELY MAINTAINABLE FORCE-REFLECTING SERVOMANIPULATOR CONCEPT
D. P. Kuban and H. L. Martin 1984 23 p refs Presented at the Am. Nucl. Soc. Meeting on Robotics and Remote Handling in Hostile Environ., Gatlinburg, Tenn., 23-27 Apr. 1984
(Contract DE-AC05-840R-21400)
(DE84-011634; CONF-840413-10) Avail: NTIS HC A02/MF A01

A remotely maintainable force reflecting servomanipulator concept was developed. This new manipulator addresses requirements of advanced nuclear fuel reprocessing with emphasis on force reflection, remote maintainability, reliability, radiation tolerance, and corrosion resistance. The advanced servomanipulator is subdivided into remotely replaceable modules which permit in situ manipulator repair by spare module replacement. Manipulator modularization and increased reliability are accomplished through a force transmission system that uses gears and torque tubes. Digital control algorithms and mechanical precision are used to offset the increased backlash, friction, and inertia resulting from the gear drives. DOE

N84-31647# Oak Ridge National Lab., Tenn.
BASIS RESEARCH ON INTELLIGENT ROBOTIC SYSTEMS OPERATING IN HOSTILE ENVIRONMENTS: NEW DEVELOPMENTS AT ORNL
J. Barhen, S. M. Babcock, W. R. Hamel, E. M. Oblow, G. N. Saridis (Rensselaer Polytechnic Inst., Troy, N.Y.), G. deSaussure, A. D. Solomon, and C. R. Weisbin Apr. 1984 24 p refs Presented at the Topical Meeting on Robotics and Remote Handling in Hostile Environments, Gatlinburg, Tenn., 23 Apr. 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE84-011464; CONF-840413-9) Avail: NTIS HC A02/MF A01

Research on robotics and artificial intelligence is reported. Activities focus on the development and demonstration of a comprehensive methodological framework for intelligent machines operating in unstructured hostile environments. Areas addressed include: mathematical modeling of robot dynamics, real time control, world modeling, machine perception and strategy planning. DOE

N84-31648# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Technical Div.
THE 100 AREA DIESEL PERFORMANCE DATA
J. A. Smith and A. A. Tudor 17 Jan. 1984 18 p
(Contract DE-AC09-76SR-00001)
(DE84-011136; DPST-84-231) Avail: NTIS HC A02/MF A01

Performance data for diesel engine-generator sets were collected to aid an analysis of the electric power system being conducted by an offsite consultant. Diesels in three different services were studied: emergency power (GM) diesels, 903 fan backup diesels and the Caterpillar diesels that power the dc motors for the D2O pumps. Data collection was convenient for the ECS booster pump diesel at the same time, even though it is not part of the electric power system. The results are published here to make them more widely available. DOE

N84-31649# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INSTRUMENTATION FOR REAL-TIME ULTRASONIC SENSING OF ARC WELDING CHARACTERISTICS
L. A. Lott and D. C. Kunerth 1984 7 p refs Presented at the 2nd Symp. on Energy Eng. Sci., Argonne, Ill., 10 Apr. 1984
(Contract DE-AC07-76ID-01570)
(DE84-012536; EGG-M-11684; CONF-8404123-6) Avail: NTIS HC A02/MF A01

Ultrasonic techniques are investigated for real-time fusion zone sensing of arc welding processes for closed-loop process control. Previous laboratory studies which demonstrated the feasibility of ultrasonic sensing of molten pool geometry are being extended to the consideration of instrumentation for use on realistic welding configurations. Experiments performed to monitor weld fusion zones in steel plates with an ultrasonic search wheel device are described. DOE

N84-31650# Centre Technique des Industries Mecaniques, Senlis (France).
COMPRESSED AIR EXHAUST SILENCERS, SUMMARY Final Report [SILENCIEUX ECHAPPEMENT AIR COMPRIME: SYNTHESE]
M. Bockhoff and J. C. Romani Apr. 1983 105 p refs In FRENCH
(CETIM-11-H-275) Avail: NTIS HC A06/MF A01

Noise reduction devices for compressed air exhaust systems were reviewed. Parameters which influence jet noise (free jets and those encountering obstructions) and silencer performance are summarized. Study of blowers shows that silenced systems making less noise than free jets are rare. By splitting the jet, however, noise reductions of 5 to 10 dB are possible without power loss. Silencers based on sintered materials are satisfactory. Techniques for avoiding choking of filters are little used, and the effects on performance do not worry manufacturers. Author (ESA)

N84-31651# Centre Technique des Industries Mecaniques, Nantes (France).
IMPROVING COMFORT OF WELDERS BY REDUCING PREHEATING TEMPERATURES Final Report [AMELIORATION DU CONFORT DES SOUDEURS PAR DIMINUTION DES TEMPERATURES DE PRECHAUFFAGE]
15 Dec. 1983 33 p refs In FRENCH Prepared in cooperation with Institut de Soudure, Paris
(CETIM-12-Y-413) Avail: NTIS HC A03/MF A01

The critical postheating temperatures of low alloy and thick steels were determined in order to reduce the preheating of welding workpieces. The test show that Cr-Mo steel weldability varies greatly with composition. Tests on the martensitic steel Z 6 CND-16-4 reveal that postheating, provides only a small (though satisfactory) protection because of pre and postheating conditions limited by the low transformation point. Author (ESA)

N84-31652# Centre Technique des Industries Mecaniques, Nantes (France).
INVESTIGATION OF IN POSITION END TO END WELDING OF AN ALUMINUM ALLOY BY ELECTRON BEAM Final Report [ETUDE DU SOUDAGE BOUT A BOUT EN POSITION PAR FAISCEAU D'ELECTIONS D'UN ALLIAGE D'ALUMINIUM]
19 Dec. 1983 47 p refs In FRENCH Prepared in cooperation with Inst. de Soudure, Paris
(CETIM-12-Y-442) Avail: NTIS HC A03/MF A01

The feasibility of electron beam welding of aluminum alloys in the cornice position was tested. Results show that maintenance of the bath is not a problem. Machining the joints to strip them improves their density. Edge displacement is small. No satisfactory way of finishing circular welds is found. Mechanical properties of the welded joints are good, although tensile test results at minus 190 C are inferior to those in the literature. Chemical composition of the melted metal does not change. Author (ESA)

N84-31653# Centre Technique des Industries Mecaniques, Senlis (France).
LUBRICATION DURING CUTTING: WEAR AND FRICTION Final Report [LUBRICATION EN DECOUPAGE: USURE ET FROTTEMENT]
Andre Ferron Feb. 1984 12 p In FRENCH
(CETIM-13-Y-322) Avail: NTIS HC A02/MF A01

The role of lubricants in the cutting of metal sheets was studied. Nonsoluble oils are recommended, but if soluble oils are used their corrosive power should be tested. Cutter flaking and wear are linked to friction parameters at the cutter-sheet interface. The friction can be determined from sheet bending, horizontal stress, and horizontal displacement. Tool wear can be monitored in real time by analyzing the stress-time curve around breaking point.

Flaking can be assessed by measuring burs in real time or by measuring horizontal stress. Author (ESA)

N84-31654# Centre Technique des Industries Mecaniques, Nantes (France).
PRELIMINARY INVESTIGATION OF WAYS TO IMPROVE THE STRENGTH OF VERTICAL ELECTROSLAG WELDING Final Report [ETUDE PRELIMINAIRE SUR LES MOYENS D'AMELIORER LA TENACITE DES SOUDURES VERTICALES SOUS LAITIER]
R. Guillard (Inst. de Soudure) 15 Dec. 1983 52 p refs In FRENCH
(CETIM-100-020) Avail: NTIS HC A04/MF A01

Literature on electroslag welding was reviewed. The concentration of the main chemical composition (C-Mn-Si-Ni-Mo) and microalloy elements (Nb-Tr-B) promote the formation of the structure desired. Nitrogen and oxygen content has a significant influence. Experiments on A 42 EP steel and 4 wire-flux combinations show that best weld strength is achieved with an acicular ferrite composite structure. Author (ESA)

N84-31655# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Afdeling Ketelbouw.
STUDY OF DIFFERENT WELDED NIPPLES IN HEADERS [STUDIE VAN VERSCHILLENDE GELASTE NIPPELVERBINDINGEN IN KOLLEKTOREN]
A. Sys Jun. 1984 44 p refs In DUTCH; ENGLISH summary
(CRIF-MT-159) Avail: NTIS HC A03/MF A01

Nipples in headers welded with full penetration, by friction welding, and welded from one side with partial penetration were tested. Stress measurements and severe fatigue tests were conducted. The attachment with full penetration was taken as reference. The general application field of the reference nipple was so determined that a maximum of efficiency was obtained. The type realized by friction welding is considered as a bad construction. For the other nipples, with fillet welds, the conditions that must be fullfilled to obtain an attachment as resistant as the one with full penetration are given. Author (ESA)

N84-31656# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
ECONOMIC APPLICATION OF ASSEMBLY ROBOTS: ELEMENTS OF SENSOR APPLICATIONS TO PROGRAMMABLE FEEDERS
D. Pherson and G. Boothroyd Jan. 1984 159 p refs
(Grant NSF MEA-81-11917)
(PB84-193200; R-1; NSF/MEA-84003) Avail: NTIS HC A08/MF A01 CSCL 13I

The fundamental groundwork performed for the design of a programmable feeder for block-like parts is described, with emphasis on the production and behavior of part orientation signatures. The technology of programmable feeders is introduced and a survey of sensor types and configurations which may be possible candidates for part signature systems is included. Special attention is focused on the behavior of the Skanamatic S17103 Sensor. The sensor's output measurement methods are considered and its response is examined as a function of distance. An experimental procedure for determining the variation of signal error with signal strength is presented. A second prototype programmable feeder and orienter is described. Appendices contain sensor specifications and signal error experimental data. Author

N84-31444# Joint Publications Research Service, Arlington, Va.
REGULATION OF MECHANICAL CHARACTERISTIC OF IRON-POWDER ELECTROMAGNETIC BRAKE Abstract only
I. Kh. Khayrullin, V. S. Syromyatnikov, Sh. G. Ismagilov, and R. N. Sultangaleyev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRA-UEE-84-008) 11 Jun. 1984 p 39 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 12, Dec. 1983 p 35-36 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31677# Borg-Warner Corp., City of Commerce, Calif. Pump Div.
CRITICAL SPEED OF CENTRIFUGAL PUMPS
S. Gopalakrishnan and Y. Usui *In* Shock and Vibration Information Center The Shock and Vibraation Digest, Vol. 16, No. 4 Apr. 1984 p 3-10 refs (For primary document see N84-31676 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/11

N84-31680# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LITERATURE REVIEW OF TILTING PAD AND TURBULENT HYDROSTATIC JOURNAL BEARINGS FOR NUCLEAR MAIN COOLANT PUMPS
R. D. Flack and P. E. Allaire *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 7 Jul. 1984 p 3-12 refs (For primary document see N84-31679 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/9

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-31657# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
REAL-TIME ULTRASONIC SENSING OF ARC WELDING PROCESSES
L. A. Lot, J. A. Johnson, and H. B. Smartt 1983 10 p refs Presented at the TMS-AIME Fall Meeting, Philadelphia, 2 Oct. 1983
(Contract DE-AC07-76ID-01570)
(DE84-005031; EGG-M-05283; CONF-8310205-7) Avail: NTIS HC A02/MF A01

The NDE techniques were for fusion zone sensing of arc welding processes or closed loop process control were investigated. Pulse echo ultrasonics for sensing the depth of penetration of molten weld pools in structural metals during welding indicate that real time ultrasonic sensing is feasible. Results on the detection of liquid/solid weld pool interfaces, the determination of interface location, and effects of high temperature gradients near the molten zones on ultrasonic wave propagation are presented. DOE

N84-31658# Sandia Labs., Albuquerque, N. Mex.
LOWER CONFIDENCE BOUNDS ON SYSTEM RELIABILITY USING COMPONENT DATA: MAXIMUM METHODOLOGY
F. W. Spencer and R. G. Easterling 1984 24 p refs Presented at Intern. Conf. on Reliability and Quality Control, Columbia, Mo., 4 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012813; SAND-84-1199C; CONF-8406135-1) Avail: NTIS HC A02/MF A01

A method of calculating approximate lower confidence bounds on system reliability, based upon binomial component data, is presented. The method is based on a system reduction algorithm by which the component data are reduced to effective binomial system data. The reduction rules treat series-parallel arrangements of components and also the use of the same data to estimate failure probabilities for different components. The confidence limits obtained are conservative for confidence levels of interest. Extensions to failure-rate estimation was also discussed. DOE

N84-31659# Centre Technique des Industries Mecaniques, Senlis (France).
DESIGN OF AN ABRASION TEST UNDER HIGH STRESS. APPLICATION TO THE CHARACTERIZATION OF MANGANESE STEEL QUALITY ASSURANCE Final Report [MISE AU POINT D'UN TEST D'ABRASION SOUS FORTES CONTRAINTES. APPLICATIONS A LA CARACTERISATION DE LA CONSTANCE

DE QUALITE DES ACIERS AU MANGANESE]
B. Rigaut and J. C. Pavy Jan. 1984 178 p refs In FRENCH
(CETIM-12-D-081) Avail: NTIS HC A09/MF A01

An abrasion test for manganese steel parts of crushers subject to wear was developed. It is based on testing samples on an abrasive cloth. It was used to characterize parts of a crusher made of Hadfield steel (12% to 14% manganese). Results show that carbon favorably influences wear behavior. Hardness also improves wear resistance, but heat treatment effects are unclear. Manganese content does not greatly influence abrasion behavior, although steels with 5% to 8% manganese do have better wear resistance. This advantage is offset by reduced toughness.
Author (ESA)

N84-31660# Centre Technique des Industries Mecaniques, Senlis (France).
NONDESTRUCTIVE TESTING OF BONDING BY ULTRASONIC ANALYSIS: PRELIMINARY STUDY REPORT PROPOSED INVESTIGATION PROGRAM Final Report [CONTROLE NON DESTRUCTIF DES COLLAGES PAR ANALYSE ULTRASONORE. RAPPORT D'ETUDE EXPLORATOIRE. PROGRAMME D'ETUDE PROPOSEE]
J. Rivenez and H. Ancenay Oct. 1983 13 p In FRENCH
(CETIM-13-V-010) Avail: NTIS HC A02/MF A01

Literature on ultrasonic analysis of bonds with adhesion and cohesion defects was reviewed. An ultrasonic method for testing samples of two bonded sheets of steel was developed. Results reveal little difference between sound and defective joint ultrasonic spectra for thick samples, but defective joints can be detected by analyzing transfer function parameters. Thin samples can be characterized by peaks in the ultrasonic spectra. Author (ESA)

N84-31661# Centre Technique des Industries Mecaniques, Senlis (France).
COMPUTER AIDED ULTRASONIC TESTING Final Report [CONTROLE ULTRASONORE-ASSISTE PAR ORDINATEUR]
P. Moulin, Y. Pralus, and A. Meyer 15 Sep. 1982 24 p In FRENCH
(CETIM-15-H-404) Avail: NTIS HC A02/MF A01

A remote controller was built to study the heuristics used by automatic material diagnostic techniques. The device enables operators to perform multidirectional analyses of flaws within a material. Software for analyzing small plane and complex flaws was developed. Author (ESA)

N84-31662# Centre Technique des Industries Mecaniques, Senlis (France).
APPLICATION OF MEASUREMENTS OF THE PROPAGATION VELOCITY OF ULTRASONIC RAYLEIGH WAVES TO SURFACE INSPECTION OF MATERIALS Final Report [APPLICATION DES MESURES DE VITESSE DE PROPAGATION DES ONDES ULTRASONORES DE RAYLEIGH A L'ETUDE SUPERFICIELLE DES MATERIAUX]
Bourse (Ecole des Mines de Douai, France), Fremiot (Ecole des Mines de Douai, France), and J. Rivenez Feb. 1984 114 p refs In FRENCH
(CETIM-15-H-417) Avail: NTIS HC A06/MF A01

An ultrasonic frequency signal acquisition and analysis system was developed for inspecting material surfaces. The system measures surface stresses by analyzing the propagation velocity of Rayleigh waves. The system is based on an Apple 2 microcomputer. Tests on aluminum alloys and stainless steels show that the system is reliable for analysis of cementation and carbonitration for thicknesses between 0.3 and 1 mm. Difficulties arise with complex geometries, but can be overcome by adapting transducers. Author (ESA)

N84-31663# Centre Technique des Industries Mecaniques, St. Etienne (France).
INFLUENCE OF CHOICE OF STEEL ON FORGING Final Report [INFLUENCE DU CHOIX DES ACIERS SUR LES PIECES FORGEES]
A. Brand and A. Durand Mar. 1983 76 p refs In FRENCH
(CETIM-1.3K.32.1) Avail: NTIS HC A05/MF A01

The effect of steel type, heat treatment and surface finishing on the quality of lifting hooks, conveyor chains, and single cylinder crankshafts was examined in fatigue and metallurgical tests. Results show that static and dynamic characteristics are closely correlated. Dynamic performance decreases with increase of static characteristics. Shot blasting improves performance. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-31664 Drexel Univ., Philadelphia, Pa.
ROLE OF TEXTURE AND STRUCTURAL DAMAGE IN PLANE STRAIN DEFORMATION PROCESSING Ph.D. Thesis
Natraj Chandrasekar Iyer 1984 174 p
Avail: Univ. Microfilms Order No. DA8408714

The two major material variables in plane strain deformation processing are crystallographic texture and structural damage. The objective was: (1) to develop an understanding of the role of these two variables as they are affected by the process parameters in plane strain deformation processing, namely strip drawing, and (2) to identify the relative influence of these two variables on the mechanical properties of the strip drawn product. Several FCC and BCC metals were strip drawn. The process parameters investigated are total thickness reduction, die angle and reduction per pass. The Delta parameter is found to be useful in relating the process parameters to the material variables. A comprehensive assessment of the relative influence of texture and structural damage on the transverse ductility of the drawn strip is presented. The exact nature of their interplay is shown to be process parameter and material characteristics dependent. The success of the drawing operation itself, however, is determined mostly by the degree of structural damage. Finally, the overall implication for process control is summarized. Dissert. Abstr.

N84-31665 Illinois Univ., Urbana-Champaign.
CRACK KINETICS OF THE NICKEL-HYDROGEN SYSTEM Ph.D. Thesis
William Wei 1984 267 p
Avail: Univ. Microfilms Order No. DA8409848

The crack growth behavior of nickel tested in gaseous hydrogen was investigated at different temperatures and pressures to determine the rate-controlling mechanism(s) for the hydrogen embrittlement of nickel, and to obtain evidence for the mechanism of the hydrogen embrittlement of nickel were tested in the temperature range 77 K to 415 K in hydrogen and nitrogen gas and in vacuum to obtain crack growth rate (da/dt or da/dN) versus stress intensity (K or delta K) data. The fracture surfaces of the specimens were examined using scanning electron microscopy, auger electron microscopy, and energy dispersive spectroscopy. Decreasing K, constant K, and fatigue tests at low frequencies and low number of cycles showed little effect of gaseous hydrogen on the crack growth behavior of nickel due to the high plasticity of the specimens. Hydrogen does affect the high cycle fatigue crack growth behavior of nickel leading to increased values of da/dN. The fractographic studies indicate that hydrogen enhances the dislocation activity along slip bands and in the fatigue substructure near the crack tip, increasing the crack growth rate above that of specimens tested in nitrogen gas or vacuum.
Dissert. Abstr.

N84-31666 Colorado Univ., Boulder.
STRENGTH AND STIFFNESS OF AISC TYPE 2 STEEL FRAMES Ph.D. Thesis
Nevis E. Cook, Jr. 1983 229 p
Avail: Univ. Microfilms Order No. DA8408019

The Type 2 concept of the AISC Specifications provides for frame analysis without explicit consideration of connection stiffness. A computer program which analyses planar steel frames was developed. The formulation accounts for the effects of nonlinear connection flexibility, residual stresses, axial loads, distributed material yielding, and finite deformations. The applied load sequence may be nonproportional. Eighteen multi-storey, multi-bay unbraced steel frames were designed using the Type 2 concept of the AISC Specifications. Selected frames from this data base were subjected to gravity, wind, and proportional loading to collapse. The Type 2 frames studied are as strong as the requirements for rigid frames set forth in the AISC Specifications, Part 2. Frames sway versus proportional loading intensity is presented, and the effects of connection flexibility on frame sway are evaluated. The results indicate that sway control is a major problem for unbraced Type 2 frames. Results concerning the importance of the P-delta effect, extent of column yielding, connection ductility requirements, and response to cycled wind loading, are also presented. Dissert. Abstr.

N84-31667 Colorado Univ., Boulder.
THE POST-BUCKLING EQUILIBRIUM AND THE DYNAMIC COLLAPSE OF COMPLEX HYPERSTATIC PIN-JOINTED LATTICES AND RETICULATED SHELLS Ph.D. Thesis
Michael don Davister 1983 296 p
Avail: Univ. Microfilms Order No. DA8408023

The theoretical elastic post-buckling behavior of complex, hyperstatic, pin-jointed lattices composed of slender members is studied under the aspect of finite deformations of a perfect lattice system loaded in the region of the ultimate critical state. Governing equations which apply immediately after a change of state are derived in matrix form and numerical methods are developed and programmed for computer use to facilitate the stability analysis of complex pin-jointed systems during both a possible dynamic collapse and under equilibrium conditions. It is shown how the behavior of a perfect structure changes beyond the ultimate critical state due to a drastic decrease in the axial stiffness of the buckling members whereupon other terms, resulting from geometrical changes and which were negligible in prebucking, play a dominant role in post-buckling. The mode associated with the largest negative change in the total potential energy of the system is of significant in regard to the stability of the system. It is shown how this mode can be evaluated directly by searching the total potential energy change hypersurface evaluated for the ultimate critical state. Dissert. Abstr.

N84-31668 Vanderbilt Univ., Nashville, Tenn.
A FINITE ELEMENT MODEL FOR THE ANALYSIS AND OPTIMAL DESIGN OF BEAMS AND PLATES WITH VARIABLE FLEXURAL RIGIDITY Ph.D. Thesis
Isaaka Aboul Mumuni 1983 249 p
Avail: Univ. Microfilms Order No. DA8409667

To minimize errors in optimal design when finite element analysis is used in the design process, non-prismatic elements incorporating a quadratic variation of flexural rigidity are developed by applying the Galerkin method of weighted residuals to the governing equations of small deflection bending theory. Assumed functions for both stresses and displacement are used. A cubic displacement function is assumed for both types of element. A two-noded beam element with a quadratic variation of bending curvature was developed and its performance was found to be excellent. Triangular plate bending elements having linear internal bending and twisting stresses and a linear variation of normal slope along the boundary were also developed. It is observed that integrating by parts in the Galerkin finite method does not reduce the continuity requirements for the problem. A finite element analysis program incorporating these elements was coupled with an optimization code based on the gradient projection method and used to solve the following optimal design problems: a cantilever beam with end moment; a simply-supported beam with linear load; a propped cantilever with uniform load; and a clamped square plate with uniform load. Dissert. Abstr.

N84-31669 Illinois Univ., Urbana.
A METHOD FOR THE COMBINATION OF STOCHASTIC TIME VARYING LOAD EFFECTS Ph.D. Thesis
Howard Thomas Pearce 1983 154 p
Avail: Univ. Microfilms Order No. DA8410018

The problem of computing the probability of failure of a structure under the combined action of a number of time varying load processes is studied. Loads arrive at points in a Poisson process and are modeled by deterministic shapes for static effects and by continuous random processes for dynamic effects. Nonlinear limit surfaces are linearized for the computation of the crossing rate of the combined vector process which is then used to estimate the failure probability. Results given by the load coincidence method for combined dynamic processes are compared with those of the point crossing method and also with simplified methods (SRSS and Turkstra) used in certain structural codes. The use of the method studied is suggested in a procedure for developing more consistent risk-based structural codes. The method is found to be relatively simple, accurate and versatile in solving the general load combination problem. Dissert. Abstr.

N84-31670 Colorado State Univ., Fort Collins.
COMPOUND STRIP METHODS FOR THE ANALYSIS OF CONTINUOUS ELASTIC PLATES Ph.D. Thesis
Jay Alan Puckett 1983 129 p
Avail: Univ. Microfilms Order No. DA8408917

A finite strip method (FSM) is developed for the analysis of linear elastic flat plate systems which are continuous over deflecting supports. The approach presented incorporates the effect of the support elements in a direct stiffness methodology. The stiffness contribution of the support elements were derived and are given in the form of strip matrices which are directly added to the plate strip stiffness matrix at the element level. This summation of plate and support stiffness contributions constitutes a substructure which is termed a compound strip. The validity of the compound strip method is demonstrated in several illustrative problems which include single and multipanel plates continuous over flexible and rigid beams and columns. The FSM and finite element method (FEM) compare favorably for displacement and moment. Dissert. Abstr.

N84-31671 Rochester Univ., N. Y.
THE EFFECTS OF INTERNAL STRESS AND PHASE TRANSFORMATIONS ON FRACTURE Ph.D. Thesis
John Russell Michener 1984 159 p
Avail: Univ. Microfilms Order No. DA8409151

The presence of internal stresses in a fracture system causes the prescription $J = 0$ to describe a line in P-X space. This line is the locus of the loading/unloading lines of the system. Internal stresses either lowers or raises the applied load necessary to advance a crack. In mode 1 systems internal stresses always reduce the work of fracture crack stability is increased or decreases. Double cantilever beam fracture specimens were fabricated and tested. Systems with opening mode bending moments were found to have increased fracture stability and reduced loads for crack advance. Systems with closing mode bending moments were found to have decreased fracture stability and increased critical loads. The observed P vs. X curve during fracture was well fitted by the predicted curves. Plastic DCB fracture may be modeled as internally stressed DCB fracture. Arm plasticity yields an apparent value of an arm bending moment and therefore an apparent value of J which is larger than the true value of J. Dissert. Abstr.

N84-31672 Illinois Univ., Urbana.
MODELING THE BEHAVIOR OF TYPE 304 STAINLESS STEEL WITH A UNIFIED CREEP-PLASTICITY THEORY Ph.D. Thesis
Thomas Eric Abrahamson 1983 123 p
Avail: Univ. Microfilms Order No. DA8409853

A two state variable unified creep-plasticity model is proposed and evaluated for type 304 stainless steel under uniaxial loading and isothermal conditions. The model is also modified so that nonisothermal behavior can be simulated. Predictions of the behavior of a two-bar structure under thermal shock loading are

compared with experimental results. A multiaxial form of the model is proposed for proportional loading, and modifications are made for nonproportional loading. The responses to two complex axial-torsion strain histories are predicted and compared with experimental data. Dissert. Abstr.

N84-31673 Illinois Univ., Urbana-Champaign.
CHARACTERIZATION OF THERMO-MECHANICAL FATIGUE Ph.D. Thesis
Huseyin Sehitoglu 1984 127 p refs
Avail: Univ. Microfilms Order No. DA8409831

If an element that undergoes a temperature change is constrained in expansion, thermal stresses develop. Four different constraint levels are identified based on simple mechanics models. The constraint types are termed total, partial, over and notch constraint. Thermo-mechanical fatigue lives for different specimen geometries, temperature ranges and constraint levels are determined. Stress versus mechanical, thermal and net strain loops are recorded and interpreted using a simple mechanics model. The damage under thermo-mechanical fatigue is characterized based on the crack tip opening displacement range. This parameter could be used to predict the lifetime of complex members subjected to variable thermo-mechanical histories. Dissert. Abstr.

N84-31674 Illinois Univ., Urbana-Champaign.
THE CHANGES IN THE COMPRESSIVE AND TENSILE YIELD STRENGTHS DURING UNIAXIAL CYCLIC LOADING Ph.D. Thesis
Eric John Tuegel 1983 80 p
Avail: Univ. Microfilms Order No. DA8410062

Many of the multiaxial unified-creep plasticity theories which were proposed as a means to improve design at elevated temperatures have suffered from the drawback that the manner in which the state variables change is difficult to measure. A unified creep-plasticity theory for uniaxial loading which uses the yield strengths in tension and compression as the state variables is investigated as the means of improving the formulation of such theories. The yield strengths are easily measured and are readily transformed to the state variables commonly used in the multiaxial theories. The model clearly demonstrates that on each loading reversal kinematic hardening is the predominate type of hardening. The observed limit cycle behavior of the state variables requires that there be an isotropic softening, or decreases in the elastic range, at the beginning of each reversal. This is followed by a rapid isotropic hardening at the end of the reversal. However, this behavior was obscured by the scatter in the data which was on the order of 10 percent of the elastic range. Dissert. Abstr.

N84-31675 Princeton Univ., N. J.
TEMPERATURE DERIVATIVES OF ELASTIC STIFFNESSES AND FREQUENCY-TEMPERATURE BEHAVIOR OF QUARTZ CRYSTAL PLATES Ph.D. Thesis
Yook-Kong Yong 1984 182 p
Avail: Univ. Microfilms Order No. DA8409632

Temperature effects on the resonant frequencies of quartz vibrators under steady and uniform temperature change are studied. Linear field equations for small vibrations superposed on thermally induced deformations by steady and uniform temperature changes are derived from the nonlinear field equations of thermoelasticity in Lagrangian formulation. The first, second and third temperature derivatives of elastic stiffness are calculated using values of the second and third order elastic stiffness, thermal expansion coefficients, and temperature coefficients of frequency of various doubly rotated quartz plates. Good agreement with experimental results are obtained when the temperature deerivatives are used to calculate the frequency-temperature curves of AT- and LC-cut plates and the loci of the zeros of the first and second temperature coefficients of frequency for thickness shear modes.
Dissert. Abstr.

N84-31676# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 16, NO. 4 Monthly Report
Judith Nagle-Eshleman, ed. Apr. 1984 100 p refs
(AD-A141077) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Recent advances in the areas of shock and vibration are discussed. Subject matter covered includes: (1) critical speed of centrifugal pumps; and (3) the response of nonlinear structures to random excitation. For individual titles, see N84-31677 through N84-31678.

N84-31677# Borg-Warner Corp., City of Commerce, Calif. Pump Div.
CRITICAL SPEED OF CENTRIFUGAL PUMPS c37
S. Gopalakrishnan and Y. Usui *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 4 Apr. 1984 p 3-10 refs (For primary document see N84-31676 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/11

Until recently critical speed calculations of pumps were made without considering the rotor dynamic effects of close clearance running fits. Publications in the last few years have made it clear that these effects must be considered in order to make the computations relevant to pump operation. This paper is a review of methods available for calculating critical speeds of pumps including rotor dynamic effects. Author

N84-31678# Calgary Univ. (Alberta). Dept. of Mechanical Engineering.
THE RESPONSE OF NONLINEAR STRUCTURES TO RANDOM EXCITATION
C. W. S. To *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 4 Apr. 1984 p 13-33 refs (For primary document see N84-31676 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

This paper provides an update of the state of the art of techniques used for the analysis of general nonlinear mechanical systems to random excitation. Special attention is paid to methods applied to multi-degree-of-freedom nonlinear systems subjected to nonstationary random excitation. Their suitability and adaptability to finite element analysis of complicated nonlinear structures with large deformation and finite strain are also assessed. Conclusions are drawn and a recommendation for future studies is given.
Author

N84-31679# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 16, NO. 7 Monthly Report
Judith Nagle-Eshleman, ed. Jul. 1984 96 p refs
(AD-A143958) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The dynamic and static operating characteristics of journal bearings and the stability and vibrations of mechanical systems are reviewed. Book reviews, previews of meetings, and educational course descriptions which relate to mechanics are presented. Abstracts of literature on the following topics are given: mechanical systems, structural systems, vehicle systems, biological systems, mechanical components, structural components, dynamic environment, mechanical properties, experimentation, and analysis and design. For individual titles, see N84-31680 through N84-31681.

N84-31680# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LITERATURE REVIEW OF TILTING PAD AND TURBULENT HYDROSTATIC JOURNAL BEARINGS FOR NUCLEAR MAIN COOLANT PUMPS c37
R. D. Flack and P. E. Allaire *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 7 Jul. 1984 p 3-12 refs (For primary document see N84-31679 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 13/9

Literature on the dynamic and static operating characteristics

of tilting-pad and turbulent hydrostatic journal bearings is reviewed. Experimental and theoretical work as well as applications in which these bearings were used in a dynamical analysis of the rotor/bearing system are included. Journal bearings receive considerable use in the nuclear power industry; such bearings in a reactor main coolant pump are considered herein. R.S.F.

N84-31681# Waterloo Univ. (Ontario). Dept. of Systems Design.
VIBRATIONS AND STABILITY OF MECHANICAL SYSTEMS, 3
K. Huseyin *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 16, No. 7 Jul. 1984 p 15-22 refs (For primary document see N84-31679 21-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

General developments in the area of vibrations and stability of mechanical systems are reviewed. Advances made since 1980 are described. Linear and nonlinear theories as well as basic methodology developed for holonomic autonomous mechanical (discrete) systems are considered. Author

N84-31682*# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
COMPUTER SIMULATION OF SURFACE AND FILM PROCESSES Semiannual Status Report, 1 May - 31 Oct. 1983
W. A. Tiller and M. T. Halicioglu [1983] 56 p refs
(Contract NCC2-125)
(NASA-CR-173682; NAS 1.26:173682; SU-DMS-84-R-2) Avail: NTIS HC A04/MF A01 CSCL 20K

Adequate computer methods, based on interactions between discrete particles, provide information leading to an atomic level understanding of various physical processes. The success of these simulation methods, however, is related to the accuracy of the potential energy function representing the interactions among the particles. The development of a potential energy function for crystalline SiO2 forms that can be employed in lengthy computer modelling procedures was investigated. In many of the simulation methods which deal with discrete particles, semiempirical two body potentials were employed to analyze energy and structure related properties of the system. Many body interactions are required for a proper representation of the total energy for many systems. Many body interactions for simulations based on discrete particles are discussed. E.A.K.

N84-31683*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR DISPLACEMENT ANALYSIS OF ADVANCED PROPELLER STRUCTURES USING NASTRAN
Charles Lawrence and Robert E. Kielb Aug. 1984 12 p refs
(NASA-TM-83737; E-2222; NAS 1.15:83737) Avail: NTIS HC A02/MF A01 CSCL 20K

The steady state displacements of a rotating advanced turboprop are computed using the geometrically nonlinear capabilities of COSMIC NASTRAN Rigid Format 4 and MSC NASTRAN Solution 64. A description of the modified Newton-Raphson algorithm used by Solution 64 and the iterative scheme used by Rigid Format 4 is provided. A representative advanced turboprop, SR3, was used for the study. Displacements for SR3 are computed for rotational speeds up to 10,000 rpm. The results show Solution 64 to be superior for computating displacements of flexible rotating structures. This is attributed to its ability to update the displacement dependent centrifugal force during the solution process. Author

N84-31684*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACTIVE CONTROLS: A LOOK AT ANALYTICAL METHODS AND ASSOCIATED TOOLS
J. R. Newsom, W. M. Adams, Jr., V. Mukhopadhyay, S. H. Tiffany, and I. Abel Jul. 1984 15 p refs Presented at 14th Congr. of the Intern. Council of the Aeron. Sci., Toulouse, 10-14 Sep. 1984
(NASA-TM-86269; NAS 1.15:86269) Avail: NTIS HC A02/MF A01 CSCL 20K

A review of analytical methods and associated tools for active controls analysis and design problems is presented. Approaches employed to develop mathematical models suitable for control system analysis and/or design are discussed. Significant efforts have been expended to develop tools to generate the models from the standpoint of control system designers' needs and develop the tools necessary to analyze and design active control systems. Representative examples of these tools are discussed. Examples where results from the methods and tools have been compared with experimental data are also presented. Finally, a perspective on future trends in analysis and design methods is presented. Author

N84-31685*# Toledo Univ., Ohio. Dept. of Civil Engineering.
THERMAL-STRESS ANALYSIS FOR WOOD COMPOSITE BLADE Report, 5 Dec. 1982 - 4 Apr. 1984
Kuan-Chen Fu and Awad Harb 20 Jul. 1984 117 p refs
(Grant NAG3-373)
(NASA-CR-173830; NAS 1.26:173830) Avail: NTIS HC A06/MF A01 CSCL 20K

The thermal-stress induced by solar insolation on a wood composite blade of a Mod-OA wind turbine was investigated. The temperature distribution throughout the blade (a heat conduction problem) was analyzed and the thermal-stress distribution of the blades caused by the temperature distribution (a thermal-stress analysis problem) was then determined. The computer programs used for both problems are included along with output examples. A.R.H.

N84-31686*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARGE DEFLECTIONS OF CIRCULAR ISOTROPIC MEMBRANES SUBJECTED TO ARBITRARY AXISYMMETRIC LOADING
A. Kelkar (Old Dominion Univ.), W. Elber, and I. S. Raju (Vigyan Research Associates) Aug. 1984 32 p refs
(NASA-TM-86271; NAS 1.15:86271) Avail: NTIS HC A03/MF A01 CSCL 20K

Circular membranes with fixed peripheral edges, subjected to arbitrary axisymmetric loading are analyzed. A single governing differential equation in terms of radial stress is used. This nonlinear governing equation is solved using the finite difference method in conjunction with Newton-Raphson method. Three loading cases, namely (1) uniformly loaded membrane, (2) a membrane with uniform load over an inner portion, and (3) a membrane with ring load, are analyzed. Calculated central displacement and the central and edge radial stresses for uniformly loaded membrane, agree extremely well with the classical solution. Author

N84-31687*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CYCLIC TORSION TESTING
Gail E. Leese Aug. 1984 21 p refs Submitted for publication
(NASA-TM-83756; E-2232; NAS 1.15:83756) Avail: NTIS HC A02/MF A01 CSCL 20K

Torsional fatigue testing and data analysis procedures are described. Since there are no standards governing cyclic torsion testing that are generally accepted on a widespread basis by the technical community, the different approaches that dominate current experimental activity, and the ramifications of each are discussed. Particular attention is given to the theoretical and experimental difficulties that have paced refinement and general acceptance of test procedures. Finally, specific quantities and nomenclature modelled after analagous axial fatigue properties are suggested as an effective way to communicate torsional fatigue results until accepted standards are established. Author

N84-31688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR STRUCTURAL ANALYSIS
Washington Jun. 1984 168 p Workshop held in Cleveland, 19-20 Apr. 1983
(NASA-CP-2297; E-1903; NAS 1.55:2297) Avail: NTIS HC A08/MF A01 CSCL 20K

Nonlinear structural analysis techniques for engine structures and components are addressed. The finite element method and boundary element method are discussed in terms of stress and structural analyses of shells, plates, and laminates. For individual titles, see N84-31689 through N84-31700.

N84-31689*# Textron Bell Aerospace Co., Buffalo, N. Y.
SLAVE FINITE ELEMENTS: THE TEMPORAL ELEMENT APPROACH TO NONLINEAR ANALYSIS
Slade Gellin *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 1-16 refs (For primary document see N84-31688 21-39)
(Contract NAS3-23279)
Avail: NTIS HC A08/MF A01 CSCL 20K

A formulation method for finite elements in space and time incorporating nonlinear geometric and material behavior is presented. The method uses interpolation polynomials for approximating the behavior of various quantities over the element domain, and only explicit integration over space and time. While applications are general, the plate and shell elements that are currently being programmed are appropriate to model turbine blades, vanes, and combustor liners. Author

N84-31690*# Massachusetts Inst. of Tech., Cambridge.
NEW VARIATIONAL FORMULATIONS OF HYBRID STRESS ELEMENTS
T. H. H. Pian, K. Sumihara, and D. Kang *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 17-29 refs (For primary document see N84-31688 21-39)
(Grant NAG3-33)
Avail: NTIS HC A08/MF A01 CSCL 20K

In the variational formulations of finite elements by the Hu-Washizu and Hellinger-Reissner principles the stress equilibrium condition is maintained by the inclusion of internal displacements which function as the Lagrange multipliers for the constraints. These versions permit the use of natural coordinates and the relaxation of the equilibrium conditions and render considerable improvements in the assumed stress hybrid elements. These include the derivation of invariant hybrid elements which possess the ideal qualities such as minimum sensitivity to geometric distortions, minimum number of independent stress parameters, rank sufficient, and ability to represent constant strain states and bending moments. Another application is the formulation of semiLoof thin shell elements which can yield excellent results for many severe test cases because the rigid body nodes, the momentless membrane strains, and the inextensional bending modes are all represented. Author

N84-31691*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
A SHEAR DEFORMABLE SHELL ELEMENT FOR LAMINATED COMPOSITES
W. C. Chao and J. N. Reddy *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 31-43 refs (For primary document see N84-31688 21-39)
Avail: NTIS HC A08/MF A01 CSCL 20K

A three-dimensional element based on the total Lagrangian description of the motion of a layered anisotropic composite medium is developed, validated, and used to analyze layered composite shells. The element contains the following features: geometric nonlinearity, dynamic (transient) behavior, and arbitrary lamination scheme and lamina properties. Numerical results of nonlinear bending, natural vibration, and transient response are presented to illustrate the capabilities of the element. Author

N84-31692*# Akron Univ., Ohio.
NONLINEAR FINITE ELEMENT ANALYSIS OF SHELLS WITH LARGE ASPECT RATIO
T. Y. Chang and K. Sawamiphakdi *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 45-54 refs (For primary document see N84-31688 21-39)
(Grant NAG3-317)
Avail: NTIS HC A08/MF A01 CSCL 20K

A higher order degenerated shell element with nine nodes was selected for large deformation and post-buckling analysis of thick or thin shells. Elastic-plastic material properties are also included. The post-buckling analysis algorithm is given. Using a square plate, it was demonstrated that the none-node element does not have shear locking effect even if its aspect ratio was increased to the order 10 to the 8th power. Two sample problems are given to illustrate the analysis capability of the shell element. Author

N84-31693*# Akron Univ., Ohio.
SELF-ADAPTIVE SOLUTION STRATEGIES
Joseph Padovan *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 55-63 refs (For primary document see N84-31688 21-39)
(Grant NAG3-54)
Avail: NTIS HC A08/MF A01 CSCL 20K

The development of enhancements to current generation nonlinear finite element algorithms of the incremental Newton-Raphson type was overviewed. Work was introduced on alternative formulations which lead to improve algorithms that avoid the need for global level updating and inversion. To quantify the enhanced Newton-Raphson scheme and the new alternative algorithm, the results of several benchmarks are presented. Author

N84-31694*# Stanford Univ., Calif.
ELEMENT-BY-ELEMENT SOLUTION PROCEDURES FOR NONLINEAR STRUCTURAL ANALYSIS
Thomas J. R. Hughes, James Winget, and Itzhak Levit *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 65-84 refs (For primary document see N84-31688 21-39)
(Grant NAG3-319)
Avail: NTIS HC A08/MF A01 CSCL 20K

Element-by-element approximate factorization procedures are proposed for solving the large finite element equation systems which arise in nonlinear structural mechanics. Architectural and data base advantages of the present algorithms over traditional direct elimination schemes are noted. Results of calculations suggest considerable potential for the methods described. Author

N84-31695*# Kent State Univ., Ohio. Dept. of Mathematical Sciences.
AUTOMATIC FINITE ELEMENT GENERATORS
Paul S. Wang *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 85-94 refs (For primary document see N84-31688 21-39)
(Grant NAG3-298)
Avail: NTIS HC A08/MF A01 CSCL 20K

The design and implementation of a software system for generating finite elements and related computations are described. Exact symbolic computational techniques are employed to derive strain-displacement matrices and element stiffness matrices. Methods for dealing with the excessive growth of symbolic expressions are discussed. Automatic FORTRAN code generation is described with emphasis on improving the efficiency of the resultant code. Author

N84-31696*# Texas Univ., Austin.
STABILITY AND CONVERGENCE OF UNDERINTEGRATED FINITE ELEMENT APPROXIMATIONS
J. Tinsley Oden *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 95-103 refs (For primary document see N84-31688 21-39)
(Grant NAG3-329)
Avail: NTIS HC A08/MF A01 CSCL 20K

The effects of underintegration on the numerical stability and convergence characteristics of certain classes of finite element approximations were analyzed. Particular attention is given to hourglassing instabilities that arise from underintegrating the stiffness matrix entries and checkerboard instabilities that arise from underintegrating constrain terms such as those arising from incompressibility conditions. A fundamental result reported here is

the proof that the fully integrated stiffness is restored in some cases through a post-processing operation. Author

N84-31697*# Georgia Inst. of Tech., Atlanta.
INELASTIC AND DYNAMIC FRACTURE AND STRESS ANALYSES
Satya N. Atluri *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 105-118 refs (For primary document see N84-31688 21-39)
(Grant NsG-3283)
Avail: NTIS HC A08/MF A01 CSCL 20K

Large deformation inelastic stress analysis and inelastic and dynamic crack propagation research work is summarized. The salient topics of interest in engine structure analysis that are discussed herein include: (1) a path-independent integral (T) in inelastic fracture mechanics, (2) analysis of dynamic crack propagation, (3) generalization of constitutive relations of inelasticity for finite deformations , (4) complementary energy approaches in inelastic analyses, and (5) objectivity of time integration schemes in inelastic stress analysis. Author

N84-31698*# Case Western Reserve Univ., Cleveland, Ohio. Grant NsG-3283
INTERACTIVE FINITE ELEMENTS FOR GENERAL ENGINE DYNAMICS ANALYSIS
Maurice L. Adams, Joseph Padovan (Akron Univ.), and Demeter G. Fertis (Akron Univ.) *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 119-130 refs (For primary document see N84-31688 21-39)
Avail: NTIS HC A08/MF A01 CSCL 20K

General nonlinear finite element codes were adapted for the purpose of analyzing the dynamics of gas turbine engines. In particular, this adaptation required the development of a squeeze-film damper element software package and its implantation into a representative current generation code. The ADINA code was selected because of prior use of it and familiarity with its internal structure and logic. This objective was met and the results indicate that such use of general purpose codes is viable alternative to specialized codes for general dynamics analysis of engines. Author

N84-31699*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR ANALYSIS FOR HIGH-TEMPERATURE COMPOSITES: TURBINE BLADES/VANES
Dale A. Hopkins and Christos C. Chamis *In its* Nonlinear Struct. Anal. Jun. 1984 p 131-147 refs (For primary document see N84-31688 21-39)
Avail: NTIS HC A08/MF A01 CSCL 20K

An integrated approach to nonlinear analysis of high-temperature composites in turbine blade/vane applications is presented. The overall strategy of this approach and the key elements comprising this approach are summarized. Preliminary results for a tungsten-fiber-reinforced superalloy (TFRS) composite are discussed. Author

N84-31700*# Pratt and Whitney Aircraft, East Hartford, Conn.
THREE-DIMENSIONAL STRESS ANALYSIS USING THE BOUNDARY ELEMENT METHOD
Raymond B. Wilson and Prasanta K. Banerjee (State Univ. of New York, Buffalo) *In* NASA. Lewis Research Center Nonlinear Struct. Anal. Jun. 1984 p 149-160 refs (For primary document see N84-31688 21-39)
(Contract NAS3-23697)
Avail: NTIS HC A08/MF A01 CSCL 20K

The boundary element method is to be extended (as part of the NASA Inelastic Analysis Methods program) to the three-dimensional stress analysis of gas turbine engine hot section components. The analytical basis of the method (as developed in elasticity) is outlined, its numerical implementation is summarized, and the approaches to be followed in extending the method to include inelastic material response indicated. Author

N84-31701# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
RESPONSE OF A PLASTER-WOOD ROOM SUBJECTED TO SIMULATED SONIC BOOMS
Nabil Naguib Wahba Jul. 1984 402 p refs Sponsored in part by National Research Council of Canada and the Ministry of Transport, Transportation Development Centre
(UTIAS-276; ISSN-0082-5255) Avail: NTIS HC A18/MF A01

The response of a room of plaster-wood construction with an open window subjected to sonic-boom loading was investigated both analytically and experimentally. The pressure variations inside the room were predicted analytically by viewing the room as a Helmholtz resonator. The UTIAS Travelling-Wave, Horn-Type, Sonic-Boom Simulator was used to generate sonic booms in order to check the analysis. The structural response of the room walls due to the pressure loading was also predicted analytically using a series solution and a finite element technique incorporating the normal-mode method. Stresses produced due to sonic-boom loading are below the ultimate stresses of the materials that constitute the walls. The statics and dynamics of a cracked plaster-wood wall were investigated using a finite-element method and checked experimentally. The measured strains in the vicinity of a crack-tip are in agreement with the predicted values. It is unlikely that propagation of a crack in a wall can occur due to sonic booms obtained from supersonic transports (SST), except in extraordinary circumstances. For a plaster-wood wall the crack will propagate if the overpressure of the incident sonic boom exceeds 265 N/sq m. For an N-wave having an overpressure of 100 N/sq m, crack propagation may occur if the crack length is larger than 0.7 of the wall width. Author

N84-31702# Naval Research Lab., Washington, D. C.
FATIGUE CRACK GROWTH BEHAVIOR OF AN OXIDE DISPERSION STRENGTHENED MA956 ALLOY
K. Sadananda and P. Shahinian Mar. 1984 13 p Repr. from Met. Transl. A, v. 15A, Mar. 1984 p 527-539
(AD-A142059) Avail: NTIS HC A02/MF A01

Fatigue crack growth behavior of oxide dispersion strengthened ferritic MA 956 alloy was studied at 25 C and 1000 C in air at 0.17 Hz. The growth rates were analyzed using the linear elastic parameter Delta K and the elastic-plastic parameter Delta J. Crack growth, although transgranular at both temperatures, increased by nearly three orders of magnitude with increase in temperature from 25 to 1000 C. The growth rates were essentially the same in terms of either Delta K or Delta J parameters indicating that plasticity effects are small even at 1000 C. Detailed fractographic analysis revealed the presence of ductile striations in the Delta K range of 25 to 40 MPa square root of M at 25 C and in a much narrower range at 1000 C. Presence of voids could be detected at 1000 C. Using the measured load-displacement hysteresis energies for a unit increment in crack length, crack growth rates were calculated using cumulative damage models and were compared with the experimental data. At 1000 C the predicted and the experimental values agree within a factor of two and it is concluded that the growth occurs essentially by a damage accumulation process except in a narrow range of Delta K where the elastic blunting process is superimposed, resulting in ductile striations that were observed. At 25 C the predicted and the experimental value reasonably agree for Delta K values greater than 40 MPa square root of M, and below this value the two diverge with predicted values being much lower. This divergence is related to occurrence of the plastic blunting process in this Delta K range as confirmed by fractographic evidence. S.B.

N84-31703# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
LONGITUDINAL VIBRATIONS OF RODS OF FINITE LENGTH WITH RADIAL DEFORMATION Final Report
J. J. Wu and W. H. Chen Mar. 1984 31 p
(AD-A142674; ARLCB-TR-84016) Avail: NTIS HC A03/MF A01 CSCL 20/11

An approximate theory of dynamics of rods was formulated by Mindlin and Herrmann in 1951. The unique feature of this

theory is that it can model the longitudinal as well as the radial motions of a rod, and yet it can retain the simplicity of a one-dimensional problem in the axial direction. Solutions pertaining to rods of infinite length were also given by Mindlin and Herrmann. This report presents vibration solutions of this rod model with finite lengths. First, the set of two partial differential equations is recapitulated together with appropriate boundary conditions. For vibration problems, two sets of eigenvalue problems are formulated to satisfy the simultaneous partial differential equatons and the homogeneous boundary conditions. These dual eigenvalue matrix equations are then solved numerically. For an infinite rod, a dispersion relation of frequency versus wave number which contains an imaginary branch has been obtained. The free vibration problem of a fixed-fixed Mindlin-Herrmann rod has been solved. The numerical values of the six (6) lowest frequencies, the associated wave numbers and mode shapes are tabulated for three different slenderness ratios. Author (GRA)

N84-31704# Aeronautical Research Labs., Melbourne (Australia).
HOW MANY SPECIMENS? AN AID IN THE DESIGN OF FATIGUE TEST PROGRAMS
A. S. Machin Jan. 1984 27 p
(AD-A142810; AD-E401119; ARL/Struc-TM-371) Avail: NTIS HC A03/MF A01 CSCL 12/1

Increasing fatigue test sample sizes increases the accuracy with which population statistics may be calculated and increases the sensitivity of tests comparing different groups of results, but it also increases testing costs. Information is presented which will aid the designer of a fatigue test program in deciding sample sizes. Author (GRA)

N84-31705# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
CREEP-FATIGUE INTERACTIONS IN ADVANCED EUTECTIC SUPERALLOYS Final Report, 1 Oct. 1979 - 30 Sep. 1983
K. N. Jones, N. Bylina, and N. S. Stoloff 20 Apr. 1984 39 p
(Grant AF-AFOSR-0015-80)
(AD-A142872; AFOSR-84-0531TR) Avail: NTIS HC A03/MF A01 CSCL 20/11

This project has been concerned with three facets of cyclic deformation of advanced eutectic composites: (1) high cycle, stress controlled fatigue; (2) stress controlled crack growth; (3) low cycle, strain controlled fatigue. Three alloys were selected for study: Nitac 14B, Cotac 744 and AG-170. Experiments have been carried out as a function of several variables: temperature, microstructure, and frequency, in order to obtain as complete a picture as possible of the relative advantages and disadvantages of the three alloys under cyclic loading conditions. In addition, the response of these alloys to cyclic deformation has been compared to that of conventional nickel base alloys. Early in the program it was noted that Cotac 744 was inferior in HCF and LCF properties to the other two alloys. Consequently, during the final year of the program LCF and da/dN tests were carried out on AG-170 and Nitac 14B only. GRA

N84-31706# Northwestern Univ., Evanston, Ill. Structural Mechanics Lab.
EFFECT OF INERTIA ON FINITE NEAR-TIP DEFORMATION FOR FAST MODE-3 CRACK GROWTH Interim Report
J. D. Achenbach and N. Nishimura Feb. 1984 31 p
(Contract N00014-76-C-0063)
(AD-A142947; NU-SML-TR-84-2) Avail: NTIS HC A03/MF A01 CSCL 20/11

The combined effects of finite deformation and material inertia ave been analyzed for fast crack growth under anti-plane loading conditions. A steady-state dynamic solution has been obtained for the finite strain on the crackline, from the moving crack tip to the moving transition boundary with the z one of small strains. The crack propagates in a material with a response curve in uniform shear that is linear at small strains, and that remains constant once a critical strain has been exceeded. The corresponding quasi-static solution is given in the full zone of large deformation. For the dynamic formulation, an explicit expression for the crack-line strain has been obtained by expanding the displacement in a power series in the distance to the crackline, with coefficients which depend on the distance to the moving crack tip. Substitution in the equation of motion yields a nonlinear ordinary differential equation for the relevant coefficient, which can be solved rigorously. The finite deformation crack-line fields have been matched to appropriate small-strain fields at the transition boundary. The principal result is that the dynamic strain remains bounded at the crack tip, apparently due to the effect of material inertia. GRA

N84-31707# Army Materials and Mechanics Research Center, Watertown, Mass.
INTERDEPENDENCE OF EQUIVALENT STEADY STRESS, CRACK GROWTH AND FAILURE ON SEQUENCE AND AMPLITUDE OF IRREGULAR LOADING Final Report
R. Beeuwkes, Jr. Feb. 1984 29 p
(DA Proj. 1L1-61102-AH-42)
(AD-A142951; AMMRC-TR-84-6) Avail: NTIS HC A03/MF A01 CSCL 20/11

This paper shows how to predict the minimum or other life of material limited by cyclic crack growth and crack failures as a function of the different sequences of amplitudes of loading that may occur under random, quasi-random, or controllable loading conditions. It is assumed that the incremental growth, as well as the criterion of failure, is independent of the history of loading and environment. The method covers the most commonly used law of crack growth and of crack failure. It is obviously applicable to other cyclically induced cumulative phenomena, e.g., degradation as in erosion or thermal fatigue. GRA

N84-31708# Naval Postgraduate School, Monterey, Calif.
AN ANALYTICAL EVALUATION OF SPALL SUPPRESSION OF IMPULSIVELY LOADED ALUMINUM PANELS BASED ON A 1-DIMENSIONAL STRESS WAVE PROPAGATION MODEL M.S. Thesis
M. K. Asada Mar. 1984 53 p
(AD-A143173) Avail: NTIS HC A04/MF A01 CSCL 20/11

The response of materials to intense impulsive loading is quite complex. For this reason, an approximate analytical method is used based upon a one dimensional elastic shock approach to analyze the effects of a shaped charge against aluminum panels. This method allows concentration on one aspect of spalling by introducing simplifying assumptions into the governing equations of continuum physics. Then with this information, means to suppress the spall can be developed in order to design or modify an armored vehicle configuration to withstand the catastrophic effects of spallation against its crew members. This work provides a broad overview of stress wave effects in aluminum panels that are caused by rapidly applied loading conditions, together with fundamental results involving elastic shock waves. Results are presented that are useful in obtaining a quantitative appreciation of the behavior of the aluminum under short duration loading. GRA

N84-31709# Sandia Labs., Albuquerque, N. Mex. Thermophysical Properties Div.
A DATA ACQUISITION AND ANALYSIS SYSTEM FOR FIBER CREEP TESTING
William D. Drotning 1984 14 p ref Presented at the HP 1000 Intern. Users Group Conf., San Jose, Calif., 9 Sep. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012654; SAND-84-0565C; CONF-840979-1) Avail: NTIS HC A02/MF A01

A minicomputer-based data acquisition and analysis system was implemented for materials research on the long-term creep and time-dependent failure of fibers. The measurement system design allows for data acquisition from multiple creep test stations operating asynchronously. System control of the environment (temperature, stress, humidity) of each test station is also available. System hardware consists of an HP 1000-L series minicomputer operating under RTE-XL control linked to an HP 2250 Measurement and Control Processor based on the L-series microcomputer. The 2250 computer is configured for detection of stress loading and

creep initiation, long-term creep and temperature data acquisition, and detection of fiber failure, while the 1000-L computer is used for overall system operation, data analysis, and program development. An operating system for fiber testing was developed to allow the user to interactively control, examine, and modify the status and functions of the multiple test stations in real time. DOE

N84-31710# Los Alamos Scientific Lab., N. Mex.
THE EFFECT OF FINITE ROTATION ON A PROBLEM IN PLASTIC DEFORMATION
John K. Dienes 1984 13 p refs Presented at the Intern. Symp. on Plasticity, Norman, Okla., 30 Jul. - 3 Aug. 1984
(Contract W-7405-eng-36)
(DE84-012627; LA-UR-84-1492; CONF-840746-1) Avail: NTIS HC A02/MF A01

The development of constitutive laws for large strain plastic flow which requires a kinematic framework to characterize the deformation and a suitable set of physical relations between the selected measures of stress and strain rate is discussed. It is argued that deformation is best characterized by taking, as the measure of strain rate, the stretching and it is assumed that it can be represented as the sum of an elastic and plastic part. Plastic flow laws are expressed in rate form and it is necessary to have a suitable definition of stress rate. It is shown that a unique stress rate follows from the necessity of formulating the constitutive law in material axes, and that such a stress rate is frame invariant. The relation of rate of angular velocity deformation and spin is shown. This formulation is used to express constitutive relations for plastic flow, including both ideal plasticity and kinematic hardening. DOE

N84-31711# Los Alamos Scientific Lab., N. Mex.
SLIDELINE VERTIFICATION FOR MULTILAYER PRESSURE VESSEL AND PIPING ANALYSIS INCLUDING TANGENTIAL ANALYSIS
L. A. VanGulick 1984 26 p refs Presented at ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract W-7405-eng-36)
(DE84-004333; LA-UR-83-3514; CONF-840647-2) Avail: NTIS HC A03/MF A01

Nonlinear finite element method (FEM) computer codes with slideline algorithm implementations should be useful for the analysis of prestressed multilayer pressure vessels and piping. Closed form solutions including the effects of tangential motion useful for verifying slideline implementations for this purpose are presented. The solutions describe stresses and displacement of a long internally pressurized elastic-plastic cylinder initially separated from an elastic outer cylinder by a uniform gap. Comparison of closed form and FEM results evaluates the usefulness of the closed form solution and the validity of the sideline implementation used. DOE

N84-31712# Ames Lab., Iowa.
CRACK INITIATION MODEL FOR STRESS CORROSION CRACKING ALPHA-BRASS
R. Ranjan and O. Buck 1983 13 p refs Presented at Intern. Symp. on Concepts of Fatigue Crack Growth Threshold, Philadelphia, 2 Oct. 1983
(Contract W-7405-3ng-82)
(DE84-012837; IS-M-465; CONF-8310268-2) Avail: NTIS HC A02/MF A01

A crack-tip opening displacement model which takes into accounts the development of corrosion pits and the initiation of microcracks as a function of applied stress and electropotential was formulated for (ALPHA)-brass in a non-tarnishing ammoniacal solution. In this model, designed for K less than or equal to Ksub ISCC, it is assumed that corrosion pits form and grow during the early stages of stress corrosion cracking. Once a critical corrosion pit depth is achieved, the strain energy release rate is large enough to initiate a microcrack. The predictions of this model in terms of the time to microcrack initiation (incubation time) are found to be in good agreement with all the experimental results obtained. Metallographic observations and scanning electron microscopy provided additional information on the transmission from pitting to microcrack initiation. It was found that the critical pit dimensions for microcrack initiation are 5 to 10 (MU)m deep (depending on stress). The calculated K/sub ISCC is consistent with that for macrocrack propagation. DOE

N84-31713# Sandia Labs., Albuquerque, N. Mex.
NASTRAN-BASED COMPUTER PROGRAM FOR STRUCTURAL DYNAMIC ANALYSIS OF HORIZONTAL AXIS WIND TURBINE
D. W. Lobitz 1984 10 p refs Presented at Horizontal-axis Wind Turbine Technol. Conf., Cleveland, 8 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-011257; SAND-84-0924C; CONF-8405153-1) Avail: NTIS HC A02/MF A01

A computer program developed for structural dynamic analysis of horizontal axis wind turbines (HAWT) is discussed. It is based on the finite element method through its reliance on NASTRAN for the development of mass, stiffness, and damping matrices of the tower and rotor, which are treated in NASTRAN as separate structures. The tower is modeled in a stationary frame and the rotor in one rotating at a constant angular velocity. The two structures are subsequently joined together (external to NASTRAN) using a time-dependent transformation consistent with the hub configuration. Aerodynamic loads are computed with an established flow model based on strip theory. Aeroelastic effects are included by incorporating the local velocity and twisting deformation of the blade in the load computation. The turbulent nature of the wind, both in space and time, is modeled by adding in stochastic wind increments. The resulting equations of motion are solved in the time domain using the implicit Newmark-Beta integrator. Preliminary comparisons with data from the Boeing/NASA MOD2 HAWT indicate that the code is capable of accurately and efficiently predicting the response of HAWTs driven by turbulent winds. DOE

N84-31714# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
ENHANCED FOURIER ALGORITHMS FOR ULTRASONIC CRACK CHARACTERIZATION
J. A. Seydel and J. A. Johnson 1984 6 p refs Presented at the 2nd Symp. on Energy Eng. Sci., Argonne, Ill., 10 Apr. 1984
(Contract DE-AC07-76ID-01570)
(DE84-012544; EGG-M-11584; CONF-8404123-5) Avail: NTIS HC A02/MF A01

The detection and processing of information in ultrasonic data that is usually ignored in the imaging process is described. It is shown that such data carries information concerning the target size; simulations and experimental data demonstrate a new data processing method which can substantially increase the sensitivity of ultrasonic image forming systems. DOE

N84-31715# Sandia Labs., Albuquerque, N. Mex. Engineering Analysis Dept.
COMBINED EXPERIMENTAL/ANALYTICAL MODELING USING COMPONENT MODE SYNTHESIS
David R. Martinez, Thomas G. Carne, and A. Keith Miller Apr. 1984 16 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013147; SAND-83-1889) Avail: NTIS HC A02/MF A01

The accuracy of computed modal frequencies and mode shapes obtained from a combined experimental/analytical model for a simple beam structure was evaluated. The structure was divided into two subsystems, and one subsystem was tested to obtain its free/free modes. Using a component mode synthesis (CMS) technique, the experimental modal data base for one subsystem was directly coupled with a finite element model of the other subsystem to create an experimental/analytical model of the total structure. Both the translational and rotational elements of the residual flexibilities and mode shapes at the interface of the experimental subsystem were measured and used in the coupling. The modal frequencies and mode shapes obtained for the combined experimental/analytical model are compared to those for a reference finite element model of the entire structure. The sensitivity of the CMS model predictions to errors in the modal

parameters and residual flexibilities, which are required to define a subsystem, are also examined. DOE

N84-31716# Centre Technique des Industries Mecaniques, Senlis (France).
EXTENSION OF FINITE ELEMENT PROGRAMS TO THERMO-ELASTOVISCOPLASTIC DOMAINS Final Report [EXTENSION DES PROGRAMMES PAR ELEMENTS FINIS AU DOMAINE THERMO-ELASTO-VISCO-PLASTIQUE]
A. Turbat Nov. 1982 102 p refs In FRENCH
(CETIM-11-A-102) Avail: NTIS HC A06/MF A01

Finite element programs for calculating the behavior of structures in quasi-static elastoviscoplastic regimes were developed. Nonlinear iterative algorithms for bodies under complex loading were derived. Only two-dimensional applications (plane or axisymmetric) are possible. The programs are integrated into the CASTOR analysis code. Author (ESA)

N84-31717# Centre Technique des Industries Mecaniques, Senlis (France).
TRANSIENT 3-DIMENSIONAL THERMOELASTICITY BY THE INTEGRAL EQUATIONS METHOD Final Report [THERMO-ELASTICITE TRANSITOIRE 3D PAR LA METHODE DES EQUATIONS INTEGRALES]
A. Chaudouet Feb. 1984 160 p refs In FRENCH
(CETIM-11-B-071) Avail: NTIS HC A08/MF A01

Computer programs for studying the thermal behavior in transient regimes of large three dimensional objects, and the elastic behavior of these objects under thermal loading in transient regimes were developed for the CASTOR code. The programs are more suitable than finite element and finite difference methods, and allow coarser grids to be used. Mass integrals can be accommodated. Author (ESA)

N84-31718# Centre Technique des Industries Mecaniques, Senlis (France).
SIMPLIFIED APPROACH TO TWO-DIMENSIONAL CYCLIC PLASTICITY PROBLEMS Final Report [APPROCHE SIMPLIFIEE DES PROBLEMES DE PLASTICITE CYCLIQUE BIDIMENSIONNELLE]
A. Turbat May 1983 101 p refs In FRENCH
(CETIM-11-B-110) Avail: NTIS HC A06/MF A01

A module of the CASTOR structural analysis program to predict the behavior of a two-dimensional structure subject to radial stabilized cyclic loads is presented. The program is based on the finite element method and is suitable for kinematic strain hardened materials. Author (ESA)

N84-31719# Centre Technique des Industries Mecaniques, Senlis (France).
PRELIMINARY STUDY ON ELASTOPLASTICITY IN LARGE TRANSFORMATIONS Final Report [ETUDE PRELIMINAIRE SUR L'ELASTO-PLASTICITE EN GRANDES TRANSFORMATIONS]
M. Dubois Feb. 1984 64 p In FRENCH
(CETIM-11-E-360) Avail: NTIS HC A04/MF A01

The EVP2D program of the CASTOR structural analysis suite was extended to include thermoelastoviscoplastic transformations of isotropic strain hardened materials. An iterative solution algorithm based on the Newton-Raphson method is outlined. Total deformation is measured by a Green-Lagrange tensor. Author (ESA)

N84-31720# Centre Technique des Industries Mecaniques, Senlis (France).
THE HOLE DRILLING METHOD FOR RESIDUAL STRESS DISTRIBUTION MEASUREMENT Final Report [MESURE DE LA DISTRIBUTION DES CONTRAINTES RESIDUELLES PAR LA METHODE DU TROU]
J. Lu, A. Niku-Lari, and J. F. Flavenot Dec. 1983 37 p refs In FRENCH
(CETIM-100730) Avail: NTIS HC A03/MF A01

The hole drilling method of residual stress measurement was extended to cases of variable depth stresses. Finite element methods were used to calculate calibration coefficients. Calculations show that variations in surface deformation with progressing depth are due to hole geometry, and not only to material removal. Standard drilling techniques do not provoke significant stresses. Results for steel-aluminum alloys are as good as those for other methods. Author (ESA)

N84-31721# Centre Technique des Industries Mecaniques, Senlis (France).
NONAX-TRANAX-CASTOR 2D Final Report [NONAX-TRANAX-CA.ST.OR. 2D]
M. Volait Dec. 1983 69 p refs In FRENCH
(CETIM-100940) Avail: NTIS HC A04/MF A01

A linear finite element module was incorporated into the CASTOR structural analysis code to enable it to handle thin shells. The program analyzes the elastic behavior of thin shells under nonaxisymmetric loads. A curve tracing program was also added. Results are satisfactory, and costs are reduced compared to the previous program. Author (ESA)

N84-31722# Centre Technique des Industries Mecaniques, Senlis (France).
FRACTURE MECHANICS FORMULAS ON MICROCOMPUTERS Final Report [FORMULAIRE RUPTURE SUR MICRO-ORDINATEURS]
M. Afzali, Z. Chaiblaine (Ecole des Mines d'Ales, France), and H. Gregoire (Ecole des Mines d'Ales, France) Sep. 1983 49 p refs In FRENCH
(CETIM-100960) Avail: NTIS HC A03/MF A01

An interactive fracture mechanics program was developed in BASIC minima on a CBM 4032 microcomputer. It furnishes stress intensity factors and the critical size of a flaw. Author (ESA)

N84-31723# Centre Technique des Industries Mecaniques, St. Etienne (France).
STATE OF TECHNIQUES FOR CRACKLING VARNISHES AND PROBLEMS POSED BY THEIR APPLICATION Final Report [ETAT DES TECHNIQUES DE VERNIS CRAQUELANTS ET DES PROBLEMES QUE POSE LEUR APPLICATION]
P. Monnier Mar. 1983 19 p refs In FRENCH Original contains color illustrations
(CETIM-1.5C.23.1) Avail: NTIS HC A02/MF A01

The properties of crackling varnishes are summarized and the procedure for stress analysis using these varnishes is outlined. For small objects, aerosol sprays give stress results that are accurate to within 20%. For larger structures, fusible lacquers are recommended, although observed stresses cannot be quantified. Both types enable the number of extensometers used to be divided by at least three. Author (ESA)

N84-31724# Centre Technique des Industries Mecaniques, St. Etienne (France).
IMPROVEMENT OF THE EQUIPMENT OF VERY LONG HORIZONTAL TENSILE TEST BENCH Final Report [AMENAGEMENT DE L'EQUIPEMENT DU BANC DE TRACTION HORIZONTAL DE GRANDE LONGUEUR]
R. Tola 9 Jun. 1983 81 p refs In FRENCH
(CETIM-5.510.05) Avail: NTIS HC A05/MF A01

A 6m 100,000 daN tensile test bench was updated. A stress sensor and swivel joint which compensates for defects due to bench construction and tool weight were installed. The hydraulic circuit was modified to obtain predetermined, constant loading rates and to maintain test loads. Uncertainty in stress measurements is 1% between 10,000 and 100,000 daN. Loading rate remains constant between 339 and 3300 daN/sec. Author (ESA)

N84-32042# Tokyo Denki Univ. (Japan).
CONSIDERATIONS ON DEFORMABLE ABILITY AND ULTIMATE STRENGTH OF ASEISMIC WALLS. PART 2: ABOUT THE DERIVATION OF A FORMULA ON ULTIMATE SHEARING STRESS OF WALLS AND ITS APPLIED VERIFICATION FOR SOME EXPERIMENTAL RESULTS
Fukuzo Suto *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec.

1983 p 93-114 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32046# Joint Publications Research Service, Arlington, Va.
SIMULATION OF VIBRATORY PROCESSES IN DAMPED STRUCTURES WITH TEMPERATURE-FREQUENCY CHARACTERISTICS OF VIBRATION ABSORBING MATERIALS TAKEN INTO ACCOUNT Abstract Only
L. Ye. Buvaylo and A. V. Ionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 18-22 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-31725* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES, A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jul. 1984 146 p
(NASA-SP-7041(42); NAS 1.21:7041(42)) Avail: NTIS HC $12.50 CSCL 05B

This bibliography lists 541 reports, articles and other documents introduced into the NASA scientific and technical information system. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. Author

N84-31726 Pennsylvania State Univ., University Park.
MATHEMATICAL MODELING OF LONGITUDINAL PROFILE ADJUSTMENT IN ALLUVIAL STREAMS Ph.D. Thesis
Robin Scott Show 1983 249 p
Avail: Univ. Microfilms Order No. DA8409100

A mathematical model has been developed describing quasi-three-dimensional, unsteady, nonuniform flow in an open channel with mobile bed for application to problems in fluvial geomorphology, especially those problems concerning river response expressed in modification of longitudinal profile. The model is solved for specific boundary and initial conditions by means of a centered-implicit, finite-difference method which is unconditionally stable and thereby capable of providing solutions over the great lengths of time commonly considered in geomorphic inquiry. In order to increase the accuracy of the solution method for a number of potential model applications, the above centered-difference method has been modified to a mixed-difference form. Numerical experiments producing ideal, generalized, graded river profiles give results showing the influence on graded profile form of downstream variation in flow discharge, bedload discharge, and sediment caliber. Dissert. Abstr.

N84-31727 Stanford Univ., Calif.
DISCRIMINATION OF IRON ALTERATION MINERALS IN REMOTE SENSING DATA Ph.D. Thesis
Timothy Elwood Townsend 1984 262 p
Avail: Univ. Microfilms Order No. DA8408372

Recent laboratory studies have shown that the iron alteration minerals hematite, goethite, and jarosite may be distinguished from one another by their spectral reflectance characteristics. Field reflectance measurements of regolith containing one or more iron alteration minerals were made in the Goldfield, Nevada, mining district with a four-channel radometer. Published laboratory data were analyzed to select band pass filters for the radiometer that wuld discriminate among the iron minerals. Samples of regolith collected from the radiometer sites were studied in the laboratory to relate reflectance properties to mineralogy. Mossbauer spectroscopy was used to identify the iron minerals present in the samples. Iron alteration minerals, when present, dominated the spectral reflectance characteristics of the regolith in the 400 to 1000 nanometer wavelength region. The location of a near infrared reflectance minimum for natural samples containing mixtures of hematite and goethite can be almost completely accounted for by the proportions of hematite and goethite, and there is no evidence of particle-size or substitution effects.
Dissert. Abstr.

N84-31728 George Washington Univ., Washington, D.C.
HYDROGEOLOGY, DIGITAL SOLUTE-TRANSPORT SIMULATION, AND GEOCHEMISTRY OF THE LOWER CRETACEOUS AQUIFER SYSTEM NEAR BALTIMORE, MARYLAND Ph.D. Thesis
Francis Hughes Chapelle 1984 234 p
Avail: Univ. Microfilms Order No. DA8410477

The hydrogeology and ground-water geochemistry of the Patuxent and Patapsco aquifers (Lower Cretaceous) near Baltimore, Maryland was investigated. Brackish-water contamination of the Patuxent aquifer has been a major water-quality problem since the early 1900's. The Patuxent aquifer presently exhibits a circular plume of brackish-water contamination about 5 miles in diameter that is centered on the Baltimore Harbor district. Erosional channels provide a conduit for brackish water to leak into the Patuxent aquifer. A two-dimensional areal solute transport model of the Patuxent aquifer was constructed. This model was used to estimate the future movement of the brackish-water plume based on alternative scenarios of aquifer use. This analysis indicates that the future movement of the chloride plume will probably be very slow. The natural water chemistry of the Patuxent aquifer is dominated by chemical processes involving dissolved iron. Near the outcrop area, oxidation of pyrite and lignite consumes dissolved oxygen and produces ledges of iron hydroxide cementation. The predominant dissolved iron species in oxic water is Fe(OH).
Dissert. Abstr.

N84-31729 Louisiana State Univ., Baton Rouge.
GEODETIC GRAPHS AND CONVEXITY Ph.D. Thesis
Michael Franklyn Bridgland 1983 157 p
Avail: Univ. Microfilms Order No. DA8409573

A graph is geodetic if each two vertices are joined by a unique shortest path. Geodetic graphs were studied in the context of convexity in graphs: for a suitable family PI of paths in a graph G, an induced subgraph H of G is defined to be PI convex if the vertex-set of H includes all vertices of G lying on paths in PI joining two vertices of H. Then G is PI-geodetic if each PI-convex hull of two vertices is a path. For the family gamma of geodesics (shortest paths) in G, the gamma-geodetic graphs are exactly the geodetic graphs of the original definition. For various families PI, the PI-geodetic graphs were characterized. The central results concern the family upsilon of chordless paths of length no greater than the diameter; the upsilon-geodetic graphs are called ultrageodetic. For graphs of diameter one or two, the ultrageodetic graphs are exactly the godetic graphs. A geometry (P,L,F) consists of an arbitrary set P, an arbitrary set L, and a set F contained as a subclass within P X L. The point-flag graph of a geometry is defined here to be the graph with vertex-set the sum of P and F

whose edges are the pairs [p,(p,1)] and [(p,1),(q,1)] with p,q elements of P, 1 an element of L, and (p,1),(q,1) elements of F. It is shown that two-connected ultrageodetic graphs of diameter greater than two are precisely the graphs obtained via the subdivision, with a constant number of new vertices, either of all of the edges incident with a single vertex in a complete graph, or of all edges of the form [p,(p,1)] in the point-flag graph of a finite projective plane. Dissert. Abstr.

N84-31730 Miami Univ., Coral Gables, Fla.
HOLOCENE SEDIMENTS AND EVOLUTION OF THE INDIAN RIVER (ATLANTIC COAST OF FLORIDA) Ph.D. Thesis
Mohammad Naghash Almasi 1983 266 p
Avail: Univ. Microfilms Order No. DA8407468

Sedimentary structure, biota, composition and texture were investigated. The morphology of the area and the past and present position of sea level are the prime factors resulting in the complex sedimentary facies. The lagoon sediment, fauna and radiocarbon dates of sediment layers indicate three major sedimentary environments: lagoon, brackish and marine. The brackish water deposits are characterized by abundant Hydrobiid sp. The lagoonal environment is recorded in those sediments which formed under conditions similar to the present day. The lagoonal environment in the study area began at the time the lagoon was flooded by sea water, about 5000-6000 years ago. The lagoonal deposits are mostly grainstone and contain a typical South Florida lagoonal fauna. Dissert. Abstr.

N84-31731*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC CALIBRATION AND PROCESSING PROCEDURE FOR REFLECTIVE BANDS ON LANDSAT-4 PROTOFLIGHT THEMATIC MAPPER
J. L. Barker, R. B. Abrams, D. L. Ball, and K. C. Leung [1984] 40 p refs Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. ERTS
(E84-10056; NASA-TM-85597; NAS 1.15:85597) Avail: NTIS HC A03/MF A01 CSCL 08B

The radiometric subsystem of NASA's LANDSAT-4 Thematic Mapper (TM) sensor is described. Special emphasis is placed on the internal calibrator (IC) pulse shapes and timing cycle. The procedures for the absolute radiometric calibration of the TM channels with a 122-centimeter integrating sphere and the transfer of radiometric calibration from the channels to the IC are reviewed. The use of the IC to calibrate TM data in the ground processing system consists of pulse integration, pulse averaging, IC state identification, linear regression analysis, and histogram equalization. An overview of the SCROUNGE-era (before August 1983) method is presented. Procedural differences between SCROUNGE and the T!PS-era (after July 1983) and the implications of these differences are discussed. Author

N84-31732*# City Coll. of the City Univ. of New York. Inst. of Marine and Atmospheric Sciences.
SYNOPTIC SCALE WIND FIELD PROPERTIES FROM THE SEASAT SASS
Willard J. Pierson, Jr., Winfield B. Sylvester, and Robert E. Salfi Washington NASA Jul. 1984 212 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAGw-266)
(E84-10169; NASA-CR-3810; NAS 1.26:3810) Avail: NTIS HC A10/MF A01 CSCL 04B

Dealiased SEASAT SEASAT A Scatterometer System SASS vector winds obtained during the Gulf Of Alaska SEASAT Experiment GOASEX program are processed to obtain superobservations centered on a one degree by one degree grid. The grid. The results provide values for the combined effects of mesoscale variability and communication noise on the individual SASS winds. These superobservations winds are then processed further to obtain estimates of synoptic scale vector winds stress fields, the horizontal divergence of the wind, the curl of the wind stress and the vertical velocity at 200 m above the sea surface, each with appropriate standard deviations of the estimates for each grid point value. They also explain the concentration of water vapor, liquid water and precipitation found by means of the SMMR Scanning Multichannel Microwave Radiometer at fronts and occlusions in terms of strong warm, moist air advection in the warm air sector accompanied by convergence in the friction layer. Their quality is far superior to that of analyses based on conventional data, which are shown to yield many inconsistencies. M.A.C.

N84-31733*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NEAR-EARTH MAGNETIC FIELD AT 1980 DETERMINED FROM MAGSAT DATA
R. A. Langel and R. H. Estes (Business and Technological Systems, Seabrook, Md.) Aug. 1984 61 p refs ERTS
(E84-10170; NASA-TM-86133; NAS 1.15:86133) Avail: NTIS HC A04/MF A01 CSCL 05B

Data from the MAGSAT spacecraft for November 1979 through April 1980 and from 91 magnetic observatories for 1978 through 1982 are used to derive a spherical harmonic model of the Earth's main magnetic field and its secular variation. Constant coefficients are determined through degree and order 13 and secular variation coefficients through degree and order 10. The first degree external terms and corresponding induced internal terms are given as a function of Dst. Preliminary modeling using separate data sets at dawn and dusk local time showed that the dusk data contains a substantial field contribution from the equatorial electrojet current. The final data set is selected first from dawn data and then augmented by dusk data to achieve a good geographic data distribution for each of three time periods: (1) November/December, 1979; (2) January/February; 1980; (3) March/April, 1980. A correction for the effects of the equatorial electrojet is applied to the dusk data utilized. The solution included calculation of fixed biases, or anomalies, for the observation data. M.A.C.

N84-31734*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERIZATION OF THE LANDSAT SENSORS' SPATIAL RESPONSES
Brian L. Markham Jul. 1984 78 p refs ERTS
(E84-10171; NASA-TM-86130; NAS 1.15:86130) Avail: NTIS HC A05/MF A01 CSCL 14B

The characteristics of the thematic mapper (TM) and multispectral scanner (MSS) sensors on LANDSATs 4 and 5 affecting their spatial responses are described, and functions defining the response of the system to an arbitrary input spatial pattern are derived, i.e., transfer functions (TF) and line spread functions (LSF). These design LSF's and TF's were modified based on prelaunch component and system measurements to provide improved estimates. Prelaunch estimates of LSF/FT's are compared to in-orbit estimates. For the MSS instruments, only limited prelaunch scan direction square-wave response (SWR) data were available. Design estimates were modified by convolving in Gaussian blur till the derived LSF/TF's produced SWR's comparable to the measurements. The two MSS instruments were comparable at their temperatures of best focus; separate calculations were performed for bands 1 and 3, band 2 and band 4. The pre-sample nadir effective instantaneous field's of view (EIFOV's) based on the .5 modulation transfer function (MTF) criteria vary from 70 to 75 meters in the track direction and 79 to 82 meters in the scan direction. For the TM instruments more extensive prelaunch measurements were available. Bands 1 to 4, 5 and 7, and 6 were handled separately as were the two instruments. Derived MTF's indicate nadir pre-sample EIFOV's of 32 to 33 meter track (bands 1 to 5, 7) and 36 meter scan (bands 1 to 5, 7) and 1245 meter track (band 6) and 141 meter scan (band 6) for both TM's. Author

N84-31735*# Hydex Corp., Fairfax, Va.
A METHOD TO COMBINE REMOTELY SENSED AND IN SITU MEASUREMENTS: PROGRAM DOCUMENTATION Interim Report
E. L. Peck, E. R. Johnson, and M. Y. Wong Greenbelt, Md. NASA. Goddard Space Flight Center May 1984 94 p refs

Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS5-27554; Proj. AgRISTARS)
(E84-10172; NASA-CR-175270; NAS 1.26:175270) Avail: NTIS HC A05/MF A01 CSCL 05B

All user and programmer information required for using the correlation area method (CAM) program is presented. This program combines measurements of hydrologic variables from all measurement technologies to produce estimated areal mean values. The method accounts for sampling geometries and measurement accuracies and provides a measure of the accuracy of the estimated mean areal value. A.R.H.

N84-31736*# Woods Hole Oceanographic Institution, Mass.
MAGSAT CORRELATIONS WITH GEOID ANOMALIES Final Report
C. O. Bowin, Principal Investigator [1984] 15 p refs ERTS
(Grant NAG5-321)
(E84-10174; NASA-CR-173853; NAS 1.26:173853) Avail: NTIS HC A02/MF A01 CSCL 05B

The MAGSAT data of the Gulf of Mexico were analyzed to define better the possible relation of the negative MAGSAT anomaly there to the negative residual geoid anomaly in the western Gulf of Mexico. The estimated magnetic crystal anomaly pattern has a magnetic low in the region of the residual geoid low, but the shape of the anomalies are different. Since the shape and location of the negative magnetic anomaly are variable depending upon the particular polynomial and curve orders used, the degree of correspondance between the residual geoid and MAGSAT lithosphere anomalies was not established definitively. R.S.F.

N84-31737*# Rochester Inst. of Tech., N. Y. School of Photographic Arts and Sciences.
LANDSAT 4 BAND 6 DATA EVALUATION Quarterly Report
15 Jun. 1984 4 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-27323)
(E84-10175; NASA-CR-173854; NAS 1.26:173854; QR-7) Avail: NTIS HC A02/MF A01 CSCL 05B

A series of images of a portion of a TM frame of Lake Ontario are presented. The top left frame is the TM Band 6 image, the top right image is a conventional contrast stretched image. The bottom left image is a Band 5 to Band 3 ratio image. This image is used to generate a primitive land cover classificaton. Each land cover (Water, Urban, Forest, Agriculture) is assigned a Band 6 emissivity value. The ratio image is then combined with the Band 6 image and atmospheric propagation data to generate the bottom right image. This image represents a display of data whose digital count can be directly related to estimated surface temperature. The resolution appears higher because the process cell is the size of the TM shortwave pixels. M.A.C.

N84-31738*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE INPE HANDOUTS TO THE 6TH LANDSAT TECHNICAL WORKING GROUP (LTWG) MEETING
Jose Luiz deBarrosAguirre, Principal Investigator, Leopoldo Edgardo Messenger Parada, and Sergio dePaulaPereira Jun. 1984 17 p Meeting held in Sao Jose dos Campos, Brazil, 12-15 Jun. 1984 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E84-10176; NASA-CR-173855; NAS 1.26:173855;
INPE-3145-PRE/530) Avail: NTIS HC A02/MF A01 CSCL 05B

LANDSAT receiving and processing system in its present configuration and status are described, as well as the experience already obtained with LANDSATs 4 and 5. The revised table of station plans for TM reception and products and of implementation schedule for data formats employing superstructure conventions is updated. Standardization of the worldwide reference systems is proposed. The INPE preliminary TM products price list is included. A TM image received and processed is shown to illustrate the appearance of the products offered. B.G.

N84-31739*# California Univ., Santa Barbara. Remote Sensing Information Sciences Research Group.
[ACTIVITIES OF THE REMOTE SENSING INFORMATION SCIENCES RESEARCH GROUP] Final Report
John E. Estes, Daniel Botkin, Donna Peuquet, Terrence Smith, and J. L. Star, Principal Investigators 1 May 1984 138 p refs ERTS
(Grant NAGw-455)
(E84-10177; NASA-CR-173856; NAS 1.26:173856) Avail: NTIS HC A07/MF A01 CSCL 05B

Topics on the analysis and processing of remotely sensed data in the areas of vegetation analysis and modelling, geo-referenced information systems, machine assisted information extraction from image data, and artificial intelligence are investigated. Discussions on support field data and specific applications of the proposed technologies are also included. For individual titles, see N84-31740 through N84-31748.

N84-31740*# California Univ., Santa Barbara. Dept. of Environmental Studies.
HABITABILITY OF THE EARTH Final Report
Daniel B. Botkin, Principal Investigator and Kerry D. Woods *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 13 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

Test methods to measure land vegetation biomass, net biological production and leaf area index by remote sensing are applied to estimate the biomass and net biological productivity of selected biomes, including the boreal forests and north temperate grasslands. Field verification is conducted in conjunction with remote sensing of pertinent variables and the development of a data base of relevant material initiated. Measurements are made in the Superior National Forest, Minnesota with the following remote sensing instruments: (1) an airborne 8 band Barnes radiometer; (2) the thematic mapper simulator flown in a NASA C-130 aircraft; (3) MSS data from LANDSAT 3; and (4) AVHRR data from the NOAA Satellite. Vegetation data collected as field verification in the Superior National Forest is summarized. M.A.C.

N84-31741*# California Univ., Santa Barbara. Remote Sensing Research Unit.
NASA PILOT LAND DATA SYSTEM
John E. Estes, J. L. Star, Principal Investigators, and Janet Franklin *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 6 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

Project development and planning for a Pilot Land Data System (PLDS) are discussed. The PLDS supplies basic information, data management, and data processing capabilities to the land research community. Topics on design and implementation, user requirements, and project management are examined. The scenarios developed thusfar are also included. M.A.C.

N84-31742*# California Univ., Santa Barbara. Remote Sensing Research Unit.
ADVANCED DATA STRUCTURE AND GEOGRAPHIC INFORMATION SYSTEMS
Donna Peuquet, Principal Investigator *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 3 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

The current state of the art in specified areas of Geographic Information Systems GIS technology is examined. Study of the question of very large, efficient, heterogeneous spatial databases is required in order to explore the potential application of remotely sensed data for studying the long term habitability of the Earth. Research includes a review of spatial data structures and storage, development of operations required by GIS, and preparation of a

testbed system to compare Vaster data structure with NASA's Topological Raster Structure. M.A.C.

N84-31743# California Univ., Santa Barbara. Dept. of Geography.
APPLYING ARTIFICIAL INTELLIGENCE TO LARGE NETWORKS c63
Terence R. Smith, Jeffrey L. Star, Principal Investigators, and Ralph Dubayah *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 4 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 09B

The use of artificial intelligence to access and process geographically dispersed data sets with the use of geographically distributed software is examined. This requires capabilities in the areas of distributed data base management, long-haul networking, information presentation, distributed problem solving and artificial intelligence. In particular, the Pilot Land Data System, the Pilot Ocean Data System, and the Pilot Climate Data Base Management System (as well as a proposed Global Resource Information System) are structured as large computer networks. The techniques of artificial intelligence are discussed as they apply in distributed problem solving. M.A.C.

N84-31744*# California Univ., Santa Barbara.
KNOWLEDGE-BASED EXPERT SYSTEMS FOR CROP IDENTIFICATION
Terence R. Smith, John E. Estes, Principal Investigators, Charlene T. Sailer, and Larry R. Tinney (Edgerton, Germeshausen and Grier, Las Vegas, Nev.) *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 4 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

The development of an improved understanding of the interactive man machine environment is investigated. In such an environment, as many feature inputs as practical would be automatically derived from a data base and input into an expert system decision making procedure. This procedure could then provide expert assistance to a trained image analyst to upgrade and improve the quantity and accuracy of the information extracted from the input data. A comparison of the similarities and differences between manual and automated image interpretation techniques is also examined. M.A.C.

N84-31745*# California Univ., Santa Barbara. Remote Sensing Research Unit.
KNOWLEDGE BASED ENGINEERING FOR SPATIAL DATABASE MANAGEMENT AND USE
Donna Peuquet, Principal Investigator *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 7 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

The use of artificial intelligence techniques that are applicable to Geographic Information Systems (GIS) are examined. Questions involving the performance and modification to the database structure, the definition of spectra in quadtree structures and their use in search heuristics, extension of the knowledge base, and learning algorithm concepts are investigated. M.A.C.

N84-31746*# California Univ., Santa Barbara. Remote Sensing Research Unit.
ANNOTATED BIBLIOGRAPHY OF GLOBAL RESOURCES INFORMATION SYSTEMS RELATED PUBLICATIONS
John E. Estes, Jeffrey L. Star, Principal Investigators, Michael J. Cosentino, and Lisa J. Mann *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 18 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

An annotated bibliography of work concerning geophysical data management systems is presented. Major topics under investigation include data acquisition, data storage, long term data preservation, architecture, preprocessing, hydrology, land resources, geology, meteorology, and applications of remote sensing techniques. M.A.C.

N84-31747*# California Univ., Santa Barbara.
GLOBAL RESOURCES INFORMATION SYSTEM Final Report
John E. Estes, Jeffrey L. Star, Principal Investigators, Michael J. Cosentino, and Lisa J. Mann *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 30 p refs ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

The basic design criteria and operating characteristics of a Global Resources Information System GRIS are defined. Researchers are compiling background material and aiding JPL personnel in this project definition phase of GRIS. A bibliography of past studies and current work on large scale information systems is compiled. The material in this bibliography will be continuously updated throughout the lifetime of this grant. Project management, systems architecture, and user applications are also discussed. M.A.C.

N84-31748*# California Univ., Santa Barbara.
THE POTENTIAL OF AI TECHNIQUES FOR REMOTE SENSING
John E. Estes, Charlene Sailer, Principal Investigators, and Larry R. tinney (Edgerton, Germeshausen and Grier, Las Vegas, Nev.) *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 34 p refs ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 05B

The current status of artificial intelligence AI technology is discussed along with imagery data management, database interrogation, and decision making. Techniques adapted from the field of artificial intelligence (AI) have significant, wide ranging impacts upon computer-assisted remote sensing analysis. AI based techniques offer a powerful and fundamentally different approach to many remote sensing tasks. In addition to computer assisted analysis, AI techniques can also aid onboard spacecraft data processing and analysis and database access and query. M.A.C.

N84-31749*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TM DIGITAL IMAGE PRODUCTS FOR APPLICATIONS
John L. Barker, Fred J. Gunther, Rochelle B. Abrams, and Dave Ball [1984] 4 p Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. ERTS
(E84-10178; NASA-TM-85598; NAS 1.15:85598) Avail: NTIS HC A02/MF A01 CSCL 05B

Computer compatible tapes (CCTs) of LANDSAT 4 thematic mapper (TM) digital image products are compared and reviewed. The following tape formats are discussed: (1) raw band-sequential data (CCT-BT); (2) calibrated data (CCT-AT); and (3) geometrically resampled data (CCT-PT). Each format represents different steps in the process of producing fully corrected TM data. The CCT-BT images are uncorrected radiometrically or geometrically, CCT-AT data are radiometrically calibrated, and CCT-PT images are both radiometrically and geometrically corrected. R.S.F.

N84-31750*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RELATIVE RADIOMETRIC CALIBRATION OF LANDSAT TM REFLECTIVE BANDS
John L. Barker [1984] 39 p ERTS
(E84-10179; NASA-TM-85599; NAS 1.15:85599) Avail: NTIS HC A03/MF A01 CSCL 05B

Raw thematic mapper (TM) calibration data from pre-launch tests and in-orbit acquisitions from LANDSAT 4 and 5 satellites are analyzed to assess the radiometric characteristics of the TM sensor. A software program called TM radiometric and algorithmic performance program (TRAPP) was used for the majority of analyses. Radiometric uncertainty in the final TM image originates from: (1) scene variability (solar irradiance and atmospheric scattering); (2) optical and electrical variability of the sensor; and (3) variability introduced during image processing. R.S.F.

N84-31751*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELAUNCH ABSOLUTE RADIOMETRIC CALIBRATION OF THE REFLECTIVE BANDS ON THE LANDSAT-4 PROTOFLIGHT THEMATIC MAPPER
John L. Barker, D. L. Ball (Computer Sciences Corp., Silver Spring, Md.), K. C. Leung (Computer Sciences Corp., Silver Spring, Md.), and J. A. Walker (Santa Barbara Research Center, Goleta, Calif.) [1984] 96 p refs ERTS
(E84-10180; NASA-TM-85600; NAS 1.15:85600) Avail: NTIS HC A05/MF A01 CSCL 08B

The results of the absolute radiometric calibration of the LANDSAT 4 thematic mapper, as determined during pre-launch tests with a 122 cm integrating sphere, are presented. Detailed results for the best calibration of the protoflight TM are given, as well as summaries of other tests performed on the sensor. The dynamic range of the TM is within a few per cent of that required in all bands, except bands 1 and 3. Three detectors failed to pass the minimum SNR specified for their respective bands: band 5, channel 3 (dead), band 2, and channels 2 and 4 (noisy or slow response). Estimates of the absolute calibration accuracy for the TM show that the detectors are typically calibrated to 5% absolute error for the reflective bands; 10% full-scale accuracy was specified. Ten tests performed to transfer the detector absolute calibration to the internal calibrator show a 5% range at full scale in the transfer calibration; however, in two cases band 5 showed a 10% and a 7% difference. Author

N84-31752*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELAUNCH ABSOLUTE RADIOMETRIC CALIBRATION OF LANDSAT-4 PROTOFLIGHT THEMATIC MAPPER
John L. Barker, D. L. Ball (Computer Sciences Corp., Silver Spring, Md.), K. C. Leung (Computer Sciences Corp., Silver Spring, Md.), and J. A. Walker (Santa Barbara Research Center, Goleta, Calif.) [1984] 10 p ERTS
(E84-10181; NASA-TM-85601; NAS 1.15:85601) Avail: NTIS HC A02/MF A01 CSCL 08B

Results are summarized and analyzed from several prelaunch tests with a 122 cm integrating sphere used as part of the absolute radiometric calibration experiments for the protoflight TM sensor carried on the LANDSAT-4 satellite. The calibration procedure is presented and the radiometric sensitivity of the TM is assessed. The internal calibrator and dynamic range after calibration are considered. Tables show dynamic range after ground processing, spectral radiance to digital number and digital number to spectral radiance values for TM bands 1, 2, 3, 4, 5, 7 and for channel 4 of band 6. A.R.H.

N84-31753*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERIZATION OF RADIOMETRIC CALIBRATION OF LANDSAT-4 TM REFLECTIVE BANDS
John L. Barker, R. B. Abrams, D. L. Ball, and K. C. Leung [1984] 103 p refs Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. ERTS
(E84-10182; NASA-TM-85602; NAS 1.15:85602) Avail: NTIS HC A06/MF A01 CSCL 05B

Prelaunch and postlaunch internal calibrator, image, and background data is to characterize the radiometric performance of the LANDSAT-4 TM and to recommend improved procedures for radiometric calibration. All but two channels (band 2, channel 4; band 5, channel 3) behave normally. Gain changes relative to a postlaunch reference for channels within a band vary within 0.5 percent as a group. Instrument gain for channels in the cold focal plane oscillates. Noise in background and image data ranges from 0.5 to 1.7 counts. Average differences in forward and reverse image data indicate a need for separate calibration processing of forward and reverse scans. Precision is improved by increasing the pulse integration width from 31 to 41 minor frames, depending on the band. M.A.C.

N84-31754*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TM DIGITAL IMAGE PRODUCTS FOR APPLICATIONS
John L. Barker, Fred J. Gunther, Rochelle B. Abrams, and Dave Ball [1984] 72 p refs Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E84-10183; NASA-TM-85620; NAS 1.15:85620) Avail: NTIS HC A04/MF A01 CSCL 05B

The image characteristics of digital data generated by LANDSAT 4 thematic mapper (TM) are discussed. Digital data from the TM resides in tape files at various stages of image processing. Within each image data file, the image lines are blocked by a factor of either 5 for a computer compatible tape CCT-BT, or 4 for a CCT-AT and CCT-PT; in each format, the image file has a different format. Nominal geometric corrections which provide proper geodetic relationships between different parts of the image are available only for the CCT-PT. It is concluded that detector 3 of band 5 on the TM does not respond; this channel of data needs replacement. The empty bin phenomenon in CCT-AT images results from integer truncations of mixed-mode arithmetric operations. R.S.F.

N84-31755*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL CHARACTERIZATION OF THE LANDSAT THEMATIC MAPPER SENSORS
Brian L. Markham and John L. Barker [1984] 44 p refs ERTS (E84-10184; NASA-TM-85621; NAS 1.15:85621) Avail: NTIS HC A03/MF A01 CSCL 08B

The spectral coverage characteristics of the two thematic mapper instruments were determined by analyses of spectral measurements of the optics, filters, and detectors. The following results are presented: (1) band 2 and 3 flatness was slightly below specification, and band 7 flatness was below specification; (2) band 5 upper-band edge was higher than specifications; (3) band 2 band edges were shifted upward about 9 nm relative to nominal; and (4) band 4, 5, and 7 lower band edges were 16 to 18 nm higher then nominal. R.S.F.

N84-31756*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTRODUCTION TO THEMATIC MAPPER INVESTIGATIONS. SECTION 1: RADIOMETRY. SECTION 2: GEOMETRY
John L. Barker and Brian L. Markham [1984] 15 p refs ERTS (E84-10185; NASA-TM-85622; NAS 1.15:85622) Avail: NTIS HC A02/MF A01 CSCL 08B

An overview of papers which deal with radiometric characterization of the TM sensor is presented. Spectral characteristics are summarized. The geometric accuracy of TM are also examined. Aspects of prelaunch and post launch sensor performance, ground processing techniques, and error correction are also investigated. M.A.C.

N84-31757*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RELATIVE RADIOMETRIC CALIBRATION OF LANDSAT TM REFLECTIVE BANDS
John L. Barker 26 Apr. 1984 217 p refs ERTS
(E84-10186; NASA-TM-85623; NAS 1.15:85623) Avail: NTIS HC A10/MF A01 CSCL 05B

A common scientific methodology and terminology is outlined for characterizing the radiometry of both TM sensors. The magnitude of the most significant sources of radiometric variability are discussed and methods are recommended for achieving the exceptional potential inherent in the radiometric precision and accuracy of the TM sensors. A.R.H.

N84-31758*# Centre National d'Etudes Spatiales, Toulouse (France).
INVESTIGATION OF LANDSAT D THEMATIC MAPPER GEOMETRIC PERFORMANCE: LINE TO LINE AND BAND TO BAND

REGISTRATION
G. Begni, Boissin, M. J. Desachy, and Perbos Jul. 1984 26 p Sponsored by NASA ERTS
(E84-10187; NASA-CR-173882; NAS 1.26:173882) Avail: NTIS HC A03/MF A01 CSCL 05B

The geometric accuray of LANDSAT TM raw data of Toulouse (France) raw data of Mississippi, and preprocessed data of Mississippi was examined using a CDC computer. Analog images were restituted on the VIZIR SEP device. The methods used for line to line and band to band registration are based on automatic correlation techniques and are widely used in automated image to image registration at CNES. Causes of intraband and interband misregistration are identified and statistics are given for both line to line and band to band misregistration. A.R.H.

N84-31759*# Arizona Univ., Tucson.
LANDSAT-4 THEMATIC MAPPER MODULATION TRANSFER FUNCTION (MTF) EVALUATION Progress Report
Robert Schowengerdt, Principal Investigator 14 Aug. 1984 12 p Sponsored by NASA ERTS
(E84-10188; NASA-CR-173883; NAS 1.26:173883) Avail: NTIS HC A02/MF A01 CSCL 05B

Results of MTF analysis of imagery of the San Mateo Bridge are consistent on two TM image dates for bands 4,5, and 7. There are indications that bands 1, 2, and 3 suffer from low image contrast, and consequently low signal to noise in the derived MTFs. The two image analysis produced reasonable results along +45 deg and -45 deg azimuths in the 2-D MTF, but poor results along the 0 deg and 90 deg azimuths. The effective instantaneous field of view is given for each band, and the image contrast for water and the bridge are compared. Graphs show overall TM system MTFs. A.R.H.

N84-31760*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AGE DISCRIMINATION AMONG BASALT FLOWS USING DIGITALLY ENHANCED LANDSAT IMAGERY
Herbert W. Blodget and Glen F. Brown (Globex, Inc., Reston, Va.) Aug. 1984 13 p refs Presented at the Am. Soc. of Photogrammetry, San Antonio, 9-14 Sep. 1984 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E84-10189; NASA-TM-86141; NAS 1.15:86141) Avail: NTIS HC A02/MF A01 CSCL 08G

Digitally enhanced LANDSAT MSS data were used to discriminate among basalt flows of historical to Tertiary age, at a test site in Northwestern Saudi Arabia. Spectral signatures compared favorably with a field-defined classification that permits discrimination among five groups of basalt flows on the basis of geomorphic criteria. Characteristics that contributed to age definition include: surface texture, weathering, color, drainage evolution, and khabrah development. The inherent gradation in the evolution of geomorphic parameters, however, makes visual extrapolation between areas subjective. Therefore, incorporation of spectrally-derived volcanic units into the mapping process should produce more quantitatively consistent age groupings. Author

N84-31761*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRESCRIPTION OF LAND-SURFACE BOUNDARY CONDITIONS IN GISS GCM 2: A SIMPLE METHOD BASED ON HIGH-RESOLUTION VEGETATION DATA BASES
Elaine Matthews Jun. 1984 21 p refs
(NASA-TM-86096; NAS 1.15:86096) Avail: NTIS HC A02/MF A01 CSCL 05B

A simple method was developed for improved prescription of seasonal surface characteristics and parameterization of land-surface processes in climate models. This method, developed for the Goddard Institute for Space Studies General Circulation Model II (GISS GCM II), maintains the spatial variability of fine-resolution land-cover data while restricting to 8 the number of vegetation types handled in the model. This was achieved by: redefining the large number of vegetation classes in the 1 deg x 1 deg resolution Matthews (1983) vegetation data base as percentages of 8 simple types; deriving roughness length, field capacity, masking depth and seasonal, spectral reflectivity for the 8 types; and aggregating these surface features from the 1 deg x 1 deg resolution to coarser model resolutions, e.g., 8 deg latitude x 10 deg longitude or 4 deg latitude x 5 deg longitude. B.W.

N84-31762*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FUNDAMENTAL REMOTE SCIENCE RESEARCH PROGRAM. PART 2: STATUS REPORT OF THE MATHEMATICAL PATTERN RECOGNITION AND IMAGE ANALYSIS PROJECT
Richard P. Heydorn Aug. 1984 44 p 2 Vol.
(NASA-TM-58260; S-536; NAS 1.15:58260) Avail: NTIS HC A03/MF A01 CSCL 05B

The Mathematical Pattern Recognition and Image Analysis (MPRIA) Project is concerned with basic research problems related to the study of he Earth from remotely sensed measurements of its surface characteristics. The program goal is to better understand how to analyze the digital image that represents the spatial, spectral, and temporal arrangement of these measurements for purposing of making selected inferences about the Earth. This report summarizes the progress that has been made toward this program goal by each of the principal investigators in the MPRIA Program. Author

N84-31763*# University of Eastern Kentucky, Richmond. Dept. of Physics and Astronomy.
STUDY OF PROTON AND NEUTRON ACTIVATION OF METAL SAMPLES IN LOW EARTH ORBIT Quarterly Technical Report
C. E. Laird 19 Jul. 1984 6 p refs
(Contract NAS8-35180)
(NASA-CR-171113; NAS 1.26:171113) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the following activities has been made: the analysis of the gamma ray spectra taken from samples flown in Spacelab 2; the search for and review of neutron and proton activation cross sections needed to analyze the results of the Long Duration Exposure Facility (LDEF) activation measurements; the consideration given to data analysis of the LDEF and Spacelab 2 samples; the plan to measure relevant cross sections with nuclear accelerator measurements; and the preparation of an extended gamma ray calibration sources continues through planning and direct measurement of gamma ray efficiency for a Ge(Li) as a function of position along the surface of the detector housing. E.R.

N84-31764# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
AFRICAN DOPPLER SURVEYS (ADOS) Final Status Report, 15 Jun. 1983 - 30 Apr. 1984
M. Kumar Jun. 1984 9 p Presented at the Intern. Symp. on Space Tech. for Geodyn., Sapron, Hungary, 9-13 Jul. 1984
(AD-A142738) Avail: NTIS HC A02/MF A01 CSCL 08/2

This report outlines the work performed between 15 June 1983 and 30 April 1984 by the Defense Mapping Agency (DMA) under the African Doppler Survey (ADOS) project. The observational data and Precise Ephemeris (PE) for 59 ADOS stations in 13 countries were distributed to the ADOS Computing Centers in the United Kingdom, Kenya and Algeria. Results of computations performed at DMA are also included. Author (GRA)

N84-31765# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
DMA (DEFENSE MAPPING AGENCY) POLICY FOR DIGITAL MC AND G (MAPPING, CHARTING, AND GEODESY) SUPPORT OF ADVANCED SYSTEMS Final Report
B. D. Shelkin Oct. 1984 5 p Presented at the 6th Interservice-Industry Training Equipment Conf., Washington, D.C., Oct. 1984
(AD-A142746) Avail: NTIS HC A02/MF A01 CSCL 08/2

The rapid expansion of requirements for digital MC&G products to support advanced weapon systems has required DMA to reevaluate its digital data policy. The agency is being called of a wide range of weapon systems and training devices. In the next

few years, the DMA level of effort will grow to encompass such diverse applications as advanced guidance systems, avionics support, situation displays for C3I and sensor strike, automated hydrographic navigation and digital flight information. In order to meet these requirements DMA must offer flexible, efficient and effective digital MC&G products. This presentation spells out DMA's objectives in the digital MC&G area and details specific methodology for reaching those objectives. The basis of this policy is the standardization and concurrent enhancement of the Digital Landmass System (DLMS) data base. DMA's efforts to upgrade the capability, coverage, applicability and access of digital data are spelled out. For the long-term, DMA's goal is to develop multiple-use data files through a prototype product evaluation program with active user participation. Author (GRA)

N84-31766# Defense Nuclear Agency, Washington, D.C.
GEODESY FOR THE LAYMAN Final Report
Dec. 1983 104 p Original contains color illustrations
(AD-A142764; DNA-TR-80-003) Avail: NTIS HC A06/MF A01 CSCL 08/5

The basic principles of geodesy are presented in an elementary form. The formation of geodetic datums is introduced and the necessity of connecting or joining datums is discussed. Methods used to connect independent geodetic systems to a single world reference system are discussed, including the role of gravity data. The 1983 edition of this publication contains an expanded discussion of satellite and related technological applications to geodesy and updated description of the World Geodetic System. The basic principles are presented through discussions of various geodetic topics such as: ellipsoids, geoid, horizontal surveying, leveling, geodetic datums and gravity. Author (GRA)

N84-31767# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Advanced Technology Div.
DMA (DEFENSE MAPPING AGENCY): THE DIGITAL REVOLUTION
M. B. Faintich 21 Jun. 1984 40 p Submitted for publication
(AD-A142787) Avail: NTIS HC A03/MF A01 CSCL 08/2

The Defense Mapping Agency (DMA) is undergoing revolutionary change in its method of operations. During the 1970's, the requirement for mapping, charting, and geodetic products changed swiftly from an emphasis on analog to digital products. These digital products are utilized by U.S. Department of Defense computer based planning, training, and weapons systems. In order to meet the increasing demand for these products, DMA has moved into an interactive computer production environment with a full scale development program to place DMA into a nearly all digital production environment in the 1990s. This paper presents the current state-of-the-art production environment within DMA, and describes the challenges to be met during the digital revolution. GRA

N84-31768# Army Engineer Topographic Labs., Fort Belvoir, Va.
TERRAIN ANALYSIS PROCEDURAL GUIDE FOR BUILT-UP AREAS (REPORT NO. 13 IN THE ETL (ENGINEER TOPOGRAPHIC LABORATORIES) SERIES ON GUIDES FOR ARMY TERRAIN ANALYSTS)
R. J. Frodigh Apr. 1984 218 p
(AD-A142918; ETL-0354) Avail: NTIS HC A10/MF A01 CSCL 08/2

This procedural guide provides the Army Terrain Analyst with the methods and procedures to generate thematic, or factor, overlays, with supportive tables, for portraying approximately 20 built-up area elements. Retrieval of information from three basic sources (topographic maps, photography, and literature) is considered, and applied techniques for development of factor overlays are documented in a step-by-step sequence. Author (GRA)

N84-31769# Utah State Univ., Logan. Earth Sciences Lab.
WATER GEOCHEMISTRY OF HYDROTHERMAL SYSTEMS, WOOD RIVER DISTRICT, IDAHO
J. Zeisloft, D. Foley, and R. Blackett Aug. 1983 24 p refs
(Contract DE-AC07-79ID-12079)
(DE84-012190; DOE/ID-12079/107) Avail: NTIS HC A02/MF A01

Hydrothermal systems of the Wood River District, central Idaho, have been studied by geologic mapping of thermal spring areas and geochemical investigations of thermal and non-thermal waters. This report summarizes the new geochemical data gathered during the study. Integration of the results of geological and geochemical studies has led to development of a target model for hydrothermal resources on the margin of the Idaho Batholith. Warfield Hot Springs, with temperatures up to 58 C flow from a major shear zone along the margin of an apophysis of the batholith. Hailey Hot Springs, with temperatures up to 60 C, occur in an area of multiple thrust faults and newly recognized, closely spaced normal faults in the Paleozoic Milligen and Wood River Formations, 2.5 km from a highly brecciated batholith contact. Other Wood River district hydrothermal systems also occur along the margins of batholith apophyses or in adjacent highly fractured Paleozoic rocks, where there are indications of batholith rocks at shallow depths (100 to 300 m) in water wells. DOE

N84-31770# Nevada Univ., Reno. Div. of Earth Sciences.
GEOLOGIC AND HYDROLOGIC RESEARCH ON THE MOANA GEOTHERMAL SYSTEM, WASHOE COUNTY, NEVADA Final Report, 1 Oct. 1982 - 31 Dec. 1983
T. Flynn and G. Ghusn, Jr. Jan. 1984 164 p refs
(Contract DE-FC03-80RA-50075)
(DE84-012409; DOE/RA-50075/2) Avail: NTIS HC A08/MF A01

Combined geologic, geophysical, geochemical, and drilling exploration surveys were used to assess the Moana geothermal resource in Washoe County, Nevada, and to determine its relationship with nearby Steamboat Hot Springs. Results show that the general geology and structure for the two systems is similar, but important differences exist with respect to reservoir rocks. Gravity data delineated the contact between important volcanic and sedimentary rocks in Moana, but contour trends did not correlate well with mapped faults. Fluid geochemistry data show major differences in bulk chemical composition, stable-light isotope ratios, and radiocarbon ages for Moana and steamboat geothermal waters. Water level measurements in observation wells in Moana show simultaneous increasing and decreasing values in different sections of the six-month monitoring period. A computer program that calculates heat output for state-of-the-art heat exchangers is described. DOE

N84-31771# Washington State Dept. of Natural Resources, Olympia. Div. of Geology and Earth Resources.
GEOLOGICAL AND GEOTHERMAL INVESTIGATION OF THE LOWER WIND RIVER VALLEY SOUTHWESTERN WASHINGTON CASCADE RANGE
D. A. Berri and M. A. Korosec 1983 69 p refs
(Contract DE-AC07-79ET-27014)
(DE84-012545; Open-File-83-5; DOE/ET-27014/T9) Avail: NTIS HC A04/MF A01

The detailed geology of the lower Wind River valley is presented with emphasis on those factors that bear significantly on development of a geothermal resource. The lower Wind river drainage consists primarily of the Ohanapecosh Formation, an Oligocene unit that is recognized across the entire southern Washington Cascade Range. The formation is at least 300 m thick in the Wind River valley area. It consists largely of volcaniclastic sediments, with minor massive pyroclastic flows, volcanic breccias and lava flows. Low grade zeolite facies metamorphism during the Miocene led to formation of hydrothermal minerals in Ohanapecosh strata. Metamorphism probably occurred at less than 180 C. DOE

N84-31772# Argonne National Lab., Ill. Geoscience and Engineering Group.
THE GEOLOGY AND PETROLEUM RESOURCES OF BASINS IN THE ASIAN ARCTIC AND OFFSHORE EAST GREENLAND
G. Ulmishek Jan. 1984 109 p refs

(Contract W-31-109-eng-38)
(DE84-012114; ANL/EES-TM-247) Avail: NTIS HC A06/MF A01

The region discussed contains 15 or 16 almost unexplored sedimentary basins. This report considers the tectonic framework and history of development of the basins, the stratigraphy and facies of their sedimentary filling, and their petroleum geology. Emphasis is put on the main factors controlling oil and gas productivity, such as the quality and maturity of potential source rocks, the presence and quality of reservoir rocks and regional seals, and the availability and expected structural style of traps. As many as nine sedimentary basins are distinguished on the shelf of East Siberia. Two of the basins, South Laptev and Novosibirsk, are filled with Paleozoic-Mesozoic rocks. Others are filled with Cretaceous and Tertiary sediments. The most probable amounts of undiscovered petroleum resources in all these offshore basins are estimated at 5.8 x 10 to the 9th power bbl of oil and 70.9 x 10 to the 12th power cu ft of gas. The onshore Yenisey-Lena basin possesses good potential (most probably 7.4 x 10 to the 9th power bbl of oil and 95.1 x 10 to the 12th power cu ft of gas), whereas the Indigirka-Zyryanka basin is estimated to be rather poor (0.5 x 10 to the 9th power bbl and 9.5 x 10 to the 12th power cu ft). DOE

N84-31773# Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
LOW TEMPERATURE GEOTHERMAL RESOURCE EVALUATION OF THE MOSES LAKE-RITZVILLE-CONNELL AREA, WASHINGTON
S. Widness Nov. 1983 28 p refs
(Contract DE-AC07-79ET-27014)
(DE84-012505; DOE/ET-27014/T8) Avail: NTIS HC A03/MF A01

The study area is located in portions of Adams, Grant, Lincoln, and Franklin counties of eastern Washington. The area is representative of a complex stratigraphic and geohydrologic system within the basalt flows of the Columbia River Basalt Group. Fluid temperature data were collected by three different agencies. The Geological Engineering Section (WSU) at Washington State University, runs a continuous fluid temperature (FT) log as part of a complete suite of geophysical logs. The US Geological Survey (USGS) runs a continuous fluid FT log in conjunction with caliper and natural-gamma logs. Southern Methodist University (SMU) and the Washington State Department of Natural Resources, Division of Geology and Earth Resources (DNR), have cooperated in gathering FT data. The DNR-SMU data were collected by taking temperature measurements at 5 m intervals. Bottom-hole temperatures (BHT) and bottom-hole depths (BHD) of selected wells are given. DOE

N84-31774# Argonne National Lab., Ill.
GEOLOGY HYDROLOGY AND MINERAL RESOURCES OF CRYSTALINE ROCK AREAS OF NORTHEASTERN US
W. Harrison, D. Edgar, P. Barosh, J. Ebel, G. Kuecher, M. Tisue, S. Tsai, M. Winters, M. Flower, and M. Sood Oct. 1983 103 p refs
(Contract W-31-109-eng-38)
(DE84-013671; ANL/ES-136-Pt-2) Avail: NTIS HC A06/MF A01

A compendium of the available information on several topics of importance in defining the geologic setting of crystalline rocks in Maine, New Hampshire, Vermont, northeastern New York (the Adirondack Mountains), Massachusetts, Rhode Island, Connecticut, southeastern New York, northern New Jersey, and southeastern Pennsylvania is given. Crystalline rocks are defined herein as bodies of medium to coarse-grained igneous and high-grade metamorphic rocks. Background information was sought to assist in evaluating the geologic suitability of such rocks for isolating high-level radioactive waste. A series of maps showing the distribution of described crystalline rock bodies of the northeastern United States is given. DOE

N84-31775# Argonne National Lab., Ill. Geoscience and Engineering Group.
GEOLOGY, HYDROLOGY, AND MINERAL RESOURCES OF CRYSTALLINE ROCK AREAS OF THE LAKE SUPERIOR REGION, US, PART 1
W. Harrison, D. Edgar, A. VanLuik (Rogers and Assoc. Engineering Corp.), W. Hinze (Purdue Univ., Ind.), L. Braile (Purdue Univ., Ind.), J. Kaliokoski (Michigan Technol. Univ.), H. Pfannkuch (Minnesota Univ., Minneapolis), H. Wright, Jr. (Michigan Technol. Univ.), M. Tisue, and M. Sood Oct. 1983 407 p ref Sponsored in part by Battelle Memorial Inst.
(Contract W-31-109-eng-38)
(DE84-012682; ANL/ES-134-Pt-1) Avail: NTIS HC A18/MF A01

A series of maps is included in this compendium of available information on defining the geologic setting of crystalline rocks in the Lake Superior region (Minnesota, Wisconsin, and the Upper Peninsula of Michigan). Crystalline rocks are defined as medium and coarse grained igneous and high grade metamorphic rocks. Topics covered include: geologic history of the region; patterns of earthquake occurrence; earthquake magnitudes and horizontal ground accelerations; crustal stress; regional fault domains; holocene faulting and vertical crustal movements; surface processes; anticipated climatic changes and effects of renewed glaciation; landforms and surficial deposits; regional surface and ground water hydrology; and commercial potential of rock and mineral prospects of mines located within or near crystalline rock bodies. DOE

N84-31776# Los Alamos Scientific Lab., N. Mex.
CLIMATIC CHANGE AND STREAMFLOW IN THE SOUTHWEST
H. B. Osborn and L. J. Lane 1984 11 p refs Presented at the American Society of Civil Engineers Spec. Conf., Flagstaff, Ariz., 24-26 Jul. 1984
(Contract W-7405-eng-36)
(DE84-012658; LA-UR-84-1415; CONF-840744-2) Avail: NTIS HC A02/MF A01

Extreme variability between summer rainfall seasons in the 1880's, followed by a summer drought in the 1890's and early 1900's, possibly combined with the influx of cattle to the region in the 1880's, may have significantly altered the range and basin ecosystems in southern Arizona and much of the Southwest. A small, but possibly meaningful, decline in summer rainfall, along with a more stable winter precipitation plus continued pressure from grazing, is the most likely explanation for continued deterioration of the rangelands. The large number of recent damaging floods on the Santa Cruz River is mostly the result of the greater incidence of fall storms, rather than a change in basin and channel characteristics. For the period 1956 to 1980, annual flood peaks for the San Pedro River were not correlated to flood peaks from the USDA-ARS Walnut Gulch Experimental Watershed, a small subdrainage of the San Pedro; this suggests that long term streamflow records on major basins are not helpful in determining the representativeness of shorter records from southeastern Arizona. DOE

N84-31777# Rijksdienst voor de Ijsselmeerpolders, Lelystad (Netherlands).
LONG TERM POLICY PLANNING CONCERNING HARDERBOS (NETHERLANDS) [LANGE TERMIJN BEHEERSPLAN HARDERBOS]
A. H. Arnoldussen 1983 104 p refs In DUTCH
(Rept-178; B8469009) Avail: NTIS HC A06/MF A01

The long term planning of the Ministry of Transport and Waters concerning the Harderbos forest (Netherlands) is presented. Recreative functions are taken into account. The ecological characteristics of Harderbos are explained. The general policy on the use of this forest and its surroundings is depicted. The long term policy planning is described, taking into account the different functions of Harderbos; landscape, forest, ground with special uses, grassland to be afforested, recreation, and fauna. Author (ESA)

N84-31778# Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
SAN JUAN MOUNTAINS AVALANCHE STUDY: EVALUATION AND PREDICTION OF AVALANCHE HAZARD, METEOROLOGICAL AND AVALANCHE OBSERVATIONS Annual Report, Oct.

1982 - Sep. 1983
Richard L. Armstrong and Betsy R. Armstrong Sep. 1983 84 p refs
(Contract DI-1-07-81-V-0230)
(PB84-202704) Avail: NTIS HC A05/MF A01 CSCL 08L

Weather, snow, and avalanche condition summaries for the 1982-1983 winter season in the Red Mountain Pass area of southwestern Colorado is presented. Air temperature, precipitation, and snow structure data were obtained from a sheltered forest clearing at an elevation of 3400 m. Wind speed and direction were measured at an exposed ridge-top site located above timberline at an elevation of 3759 m. Avalanche activity was monitored by the systematic observation of 214 individual avalanche paths located adjacent to 58 km of U.S. Highway 550 between the town of Ouray and Coal Bank Hill, along 14 km of Colorado Highway 110 between Silverton and Gladstone, and within the immediate area of Silverton itself. A data summary for the period of record, 1971-1983, is also presented. Author (GRA)

N84-31779# National Academy of Sciences - National Research Council, Washington, D. C.
POLAR RESEARCH BOARD REPORT, 1983 AND FUTURE PLANS Annual Report, 1983
1984 68 p refs
(PB84-194315) Avail: NTIS HC A04/MF A01 CSCL 08L

The composition of the Polar Research Board, its origins, objectives, scope of work, as well as its principal activities and accomplishments during 1983 are described. Aspects of the Board's programs and responsibilities as U.S. National Committee for the Scientific Committee on Antarctic Research of the International Council of Scientific Unions are summarized. Areas of interest for research discussed include, oceanography, marine biology, snow, ice, permafrost, mineral resources, conservation, glaciology, and the geosciences of the Arctic and Antarctic solid earth.A.R.H.

N84-31780# Massachusetts Inst. of Tech., Cambridge. Sea Grant College Program.
A PIONEER DEEP OCEAN MINING VENTURE
J. D. Nyhart, M. S. Triantafyllou, J. Averback, A. Bliek, B. Sklar, M. Gillia, D. Kirkpatrick, J. Muggerridge, R. Nakagawa, J. Newman et al Feb. 1984 275 p refs
(Grant NA79AA-D-0010)
(PB84-199645; MITSG-83-14; NOAA-84052408) Avail: NTIS HC A12/MF A01 CSCL 08I

The M.I.T-NOAA Deep Ocean Mining Model is a flexible tool meant primarily as a basis for comparing the economic outcomes of a deep ocean mining venture under differing sets of assumptions as to costs, timing, regulatory policies, etc. The user can very easily choose the assumptions desired for a particular analytic purpose and introduce them in the computer program. In this study, three kinds of assumptions are made explicit and introduced into the model. First, a basic narrative of likely events is provided. It has been worked out in collaboration with the NOAA Division of Marine Minerals and the consultants to that office, identified in Chapter 1 B of this report. Second, capital and operating costs have been estimated, drawing on different sources, identified in the text and appendices, including the NOAA consultants. In some cases, alternative costs or ranges have been provided in addition to the estimates of the project team and the consultants.
Author (GRA)

N84-31238# Joint Publications Research Service, Arlington, Va.
AZERBAIJAN INSTITUTE DEVELOPS SUBSATELLITE MEASUREMENT SYSTEMS
T. Ismailov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 133-136 Transl. into ENGLISH from Pravda (Moscow), 27 Mar. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-31781*# California Inst. of Tech., Pasadena.
IUE OBSERVATIONS OF VARIABLE TYPE I SEYFERT GALAXIES Semiannual Report, 1 Jul. - 31 Dec. 1984
J. B. Oke 31 Dec. 1983 19 p refs
(Grant NAG5-250)
Avail: NTIS HC A02/MF A01 CSCL 10A

Results of hydrogen-passivated, polycrystalline silicon solar cells research are summarized. Most of the studies were performed on very small grain or short minority-carrier diffusion length silicon. Hydrogenated solar cells fabricated from this material appear to have effective minority-carrier diffusion lengths that are still not very long, as shown by the open-circuit voltages of passivated cells that are still significantly less than those of single crystal solar cells. The short-circuit current of solar cells fabricated from large-grain cast polycrystalline silicon is nearly equivalent to that of single-crystal cells, which indicates long bulk minority-carrier diffusion length. However, the open-circuit voltage, which is sensitive to grain boundary recombination, is 20 to 40 mV less. The aim was to minimize the variations in open-circuit voltage and fill-factor that are caused by structural defects by passivating these defects using a hydrogenation process. Author

N84-31782*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PHOTOVOLTAICS: THE ENDLESS SPRING
Henry W. Brandhorst, Jr. 1984 15 p Presented at the 17th Photovoltaic Spec. Conf., Kissimmee, Fla., 1-4 May 1984; sponsored by the Institute of Electrical and Electronic Engineers
(NASA-TM-83684; E-2121; NAS 1.15:83684) Avail: NTIS HC A02/MF A01 CSCL 10A

An overview of the developments in the photovoltaic field over the past decade or two is presented. Accomplishments in the terrestrial field are reviewed along with projections and challenges toward meeting cost goals. The contrasts and commonality of space and terrestrial photovoltaics are presented. Finally, a strategic philosophy of photovoltaics research highlighting critical factors, appropriate directions, emerging opportunities, and challenges of the future is given. Author

N84-31783*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Systems Technology.
WIND TURBINE GENERATOR INTERACTION WITH CONVENTIONAL DIESEL GENERATORS ON BLOCK ISLAND, RHODE ISLAND. VOLUME 2: DATA ANALYSIS Final Report
V. F. Wilreker, P. H. Stiller, G. W. Scott, V. J. Kruse, and R. F. Smith Feb. 1984 140 p refs
(Contracts DEN3-954; DE-AI01-76ET-20320)
(NASA-CR-168319; DOE/NASA/0354-2; NAS 1.26:168319; AST-84-1808-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 10A

Assessing the performance of a MOD-OA horizontal axis wind turbine connected to an isolated diesel utility, a comprehensive data measurement program was conducted on the Block Island Power Company installation on Block Island, Rhode Island. The detailed results of that program focusing on three principal areas of (1) fuel displacement (savings), (2) dynamic interaction between the diesel utility and the wind turbine, (3) effects of three models of wind turbine reactive power control are presented. The approximate two month duration of the data acquisition program conducted in the winter months (February into April 1982) revealed performance during periods of highest wind energy penetration

and hence severity of operation. Even under such conditions fuel savings were significant resulting in a fuel reduction of 6.7% while the MOD-OA was generating 10.7% of the total electrical energy. Also, electrical disturbance and interactive effects were of an acceptable level. Author

N84-31784*# Catalytic, Inc., Philadelphia, Pa.
AFB/OPEN CYCLE GAS TURBINE CONCEPTUAL DESIGN STUDY Final Report
T. W. Dickinson and R. Tashjian Sep. 1983 422 p refs
(Contracts DEN3-257; DE-AI01-77ET-13111)
(NASA-CR-168135; DOE/NASA/0257-1; NAS 1.26:168135; CATALYTIC-43790) Avail: NTIS HC A18/MF A01 CSCL 10B

Applications of coal fired atmospheric fluidized bed gas turbine systems in industrial cogeneration are identified. Based on site-specific conceptual designs, the potential benefits of the AFB/gas turbine system were compared with an atmospheric fluidized design steam boiler/steam turbine system. The application of these cogeneration systems at four industrial plant sites is reviewed. A performance and benefit analysis was made along with a study of the representativeness of the sites both in regard to their own industry and compared to industry as a whole. A site was selected for the conceptual design, which included detailed site definition, AFB/gas turbine and AFB/steam turbine cogeneration system designs, detailed cost estimates, and comparative performance and benefit analysis. Market and benefit analyses identified the potential market penetration for the cogeneration technologies and quantified the potential benefits. Author

N84-31785# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TWO YEARS EXPERIENCE TESTING SOLAR COLLECTORS IN BRAZIL
Joergdieter Anhalt Aug. 1984 34 p refs
(INPE-3221-RPE/461) Avail: NTIS HC A03/MF A01

Based on a bilateral agreement on scientific and technological cooperation between Brazil and the Federal Republic of Germany, a test facility was installed at the site of INPE/CNPq near Atibaia, Sao Paulo, to test solar collectors. Four independent testloops allow the measurement of the efficiency of solar collectors up to a temperature of 250 C. The test facility is described and the essential requirements for the determination of an efficiency curve are viewed. From about 26 solar collectors originating from Brazilian or foreign companies have been determined the short term performance efficiency. During a longer period the collectors have also been observed in order to answer some questions about their durability. The short term performance of the majority of the collectors was found to be satisfactory, while the long term performance tests uncovered imperfections in construction and workmanship. The test results are listed, the malfunctions described, and some recommendations should incite the manufacturers to improve their products. Author

N84-31786# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING GAS-TURBINE POWER STATIONS WITH AIRCRAFT ENGINES FOR POWER-AND-HEAT GENERATION
A. A. Margaryan 1 Jun. 1984 9 p Transl. into ENGLISH from Prom. Arm. (USSR), no. 6, 1972 p 13-15
(AD-A142084; FTD-ID(RS)T-0072-84) Avail: NTIS HC A02/MF A01 CSCL 10/2

The purpose is to determine certain power engineering indices of gas turbine engines used to generate electricity and heat. The RD-3M-500 engine is discussed. It is concluded that the engine would be useful for the generation of heat and electricity in regions located far from large power sources when these regions had limited water and fuel supplies. R.J.F.

N84-31787# Department of Energy, Washington, D. C.
JET SPOILER ARRANGEMENT FOR WIND TURBINE Patent Application
Jack D. Cyrus, Emil G. Kablec, and Paul C. Klimas, inventors (to DOE) Filed 15 Sep. 1983 13 p
(Contract DE-AC04-76DP-00789)
(DE84-011303; US-Patent-Appl-SN-532430) Avail: NTIS HC A02/MF A01

An air jet spoiler arrangement is provided for a Darrieus-type vertical axis wind-powered turbine. Air is drawn into hollow turbine blades through air inlets at the end thereof and is ejected in the form of air jets through small holes or openings provided along the lengths of the blades. The air jets create flow separation at the surfaces of the turbine blades, thereby including stal conditions and reducing the output power. A feedback control unit senses the power output of the turbine and controls the amount of air drawn into the air inlets accordingly. DOE

N84-31788# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
WIND ENERGY: A BRIEF ASSESSMENT
Jun. 1983 48 p refs
(Contract DE-AC02-77CH-00178)
(DE84-012208; DOE/CH-00178/T21) Avail: NTIS HC A03/MF A01

This document includes discussions about wind energy technology, its applications, technical and economic performance, future developments, and legal and environmental issues. Maps showing the general locations of good wind power resources are also presented. This information can be used to screen out unpromising applications and to key into more detailed, local wind resource data. Sources of further information are listed. DOE

N84-31789# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SERI PHOTOVOLTAICS ADVANCED RESEARCH AND DEVELOPMENT: FY 1983 ACCOMPLISHMENTS
Mar. 1984 56 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004493; SERI/PR-211-2236) Avail: NTIS HC A04/MF A01

This report contains the technical highlights of SERI's program in photovoltaics research and development and a bibliography of resulting publications for FY 1983, SERI's participation in a Thin Film Research Task Force appointed by the U.S. Department of Energy led to the formation of technology offices having broad program and implementation responsibilities. This kind of an office was begun at SERI in the amorphous silicon area. A multiyear cost-sharing (federal-industry) initiative was also begun to spur industrial R and D in high-efficiency, single-junction and multijunction amorphous silicon thin film solar cells, and steps were taken to further develop measurement and device analysis capablities of solar cells. The FY 1983 accomplishments are categorized according to SERI's subcontract R and D areas: amorphous thin films, advanced high-efficiency concepts, polycrystalline thin flms, polycrystalline silicon, and photoelectrochemical cells. These accomplishments are also broken down according to SERI's internal PV tasks: PV devices and measurements, solid state research, insulation resource assessment, advanced PV systems research, and performance criteria/test methods development. DOE

N84-31790# Argonne National Lab., Ill. Materials Science and Technology Div.
OCEAN THERMAL ENERGY CONVERSION: MATERIALS ISSUES
J. B. Darby, Jr. 1984 10 p refs Presented at the Conf. on Mater. for Future Energy Systems, Washington, D.C., 1-3 May 1984
(Contract W-31-109-eng-38)
(DE84-012094; CONF-840570-3) Avail: NTIS HC A02/MF A01

The Ocean thermal Energy Conversion (OTEC) Program, in the Ocean Energy Technology Division of the U.S. Department of Energy, is concerned with the development of options that can be utilized to extract and distribute significant amounts of energy from the ocean. The biofouling control and materials portion of the program is concerned with the development of effective and environmentally acceptable methods to minimize biofouling and

corrosion in high thermal conductivity materials suitable for use in heat exchangers and condensers. The mechanical and chemical techniques employed for biofouling control are reviewed and the recent success with chlorination is presented. The corrosion of aluminum alloys, copper alloys, stainless steel, stainless alloys, and titanium in near-surface warm and deep cold water is reviewed with emphasis on aluminum alloys. The major materials issues are reviewed with emphasis on lifetime and cost. DOE

N84-31791# Sandia Labs., Albuquerque, N. Mex.
NEUTRON DAMAGE EFFECTS IN AlGaAs/GaAs SOLAR CELLS
C. E. Barnes and J. J. Wiczer 1984 5 p refs Presented at the 21st IEEE Ann. Conf., on Nucl. and Space Radiation Effects, Colorado Springs, Colo., 22 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-009448; SAND-84-0579C; CONF-840712-3) Avail: NTIS HC A02/MF A01

The AlGaAs/GaAs solar cells examined in the study were obtained from three sources. One set consisted of four layers of epitaxial material grown on n-type GaAs substrates by metal organic chemical vapor deposition (MOCVD). Following deposition of a thick n-type GaAs buffer layer, the p-type GaAs active layer is grown, followed by deposition of the AlGaAs window layer and a (+) GaAs contacting layer. The second set are also grown by MOCVD, but a top GaAs contacting layer is not used. The third set are fabricated by liquid phase epitaxy, and they do not have a top contacting layer. In addition to forward and reverse I-V characteristics and capacitance-reverse voltage measurements, quantum efficiency spectra were taken beteen 350 nm and 900 nm prior to and following fast neutron irradiation in the Sandia Pulsed Reactor (SPR II). DOE

N84-31792# Sandia Labs., Albuquerque, N. Mex.
SOLAR THERMAL PARABOLIC DISH SYSTEMS: TECHNOLOGY AND APPLICATIONS
James A. Leonard 1984 10 p refs Presented at Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012239; SAND-84-0632C; CONF-840804-15) Avail: NTIS HC A02/MF A01

The status and some probable future courses of development of parabolic dish solar collector technology and some of the near-term and long-range applications of the technology are surveyed. Included are fundamentals of the technology, descriptions of current collectors with particular emphasis on the types developed within the Department of Energy's Solar Thermal Program, descriptions of current systems and applications, key technical issues and tradeoff considerations which affects the competition between parabolic dish systems and other solar thermal technologies, and finally, a discussion of future possibilities for the development of parabolic dish technology. DOE

N84-31793# Argonne National Lab., Ill. Components Technology Div.
MAGNETICALLY CONFINED KINETIC-ENERGY STORAGE RING: A NEW FUNDAMENTAL ENERGY-STORAGE CONCEPT
John R. Hull and Malvern K. Iles (Ames Lab.) Feb. 1984 109 p refs
(Contract W-31-109-eng-38)
(DE84-011531; ANL-84-19) Avail: NTIS HC A06/MF A01

The magnetically confined kinetic-energy storage ring (MC-KESR) is a new, fundamental type of energy-storage device. Energy is stored as kinetic energy in mass circulated at high velocity around a circular loop. The constraining force necessary to keep the circulating ring from flying apart is provided by radial, inwardly directed forced exerted along the permimeter of the loop by magnetic fields. The magnets and ring are contained in a tunnel, which may be buried in the ground. Levitational support against gravity is also provided by magnetic fields. Energy insertion or extraction is similar to that for a synchronous motor. DOE

N84-31794# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
ANALYSIS OF WIND TURBINES IN YAW
Robert E. Wilson and Somsak Chaiyapinunt Sep. 1983 168 p refs Prepared for Rockwell International Corp., Golden, Colo.
(Contract DE-AC04-76DP-03533)
(DE84-013620; RFP-3678) Avail: NTIS HC A08/MF A01

The yaw problems of a three-bladed, downwind, horizontal axis wind turbine are examined. A four-degree-of-freedom system was chosen to model the turbine. Linearized equations of rotor and nacelle motion were developed using the energy method and Lagrange's equations. Quasi-steady blade element and momentum theories were used in developing the axial induction factor and aerodynamic loads. A computer code was developed to obtain the numerical values of coefficients of the equations of motion, thus allowing the cause of yaw instability to be studied. The study indicated that yaw tracking error is primarily caused by tower shadow. However, the wind turbine studied, besides being unstable in yaw under normal operating conditions, has an additional problem in that the nacelle shape contributes to additional instability. Blade coning, in the present design, is inadequate to overcome this instability. The sensitivity of the system stiffness coefficients to the selected input parameters was studied, and results indicate that the system stiffness coefficient is highly sensitive to the coning angle. Increasing the coning angle could significantly increase the stiffness coefficient and lead to improvement of system stability. DOE

N84-31795# Dayton Univ., Ohio. Research Inst.
CONCEPTUAL DESIGN OF AN ELECTROFLUID DYNAMIC WIND ENERGY SYSTEM
J. E. Minardi and M. O. Lawson May 1984 30 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004512; SERI/STR-211-2277) Avail: NTIS HC A03/MF A01

A conceptual design of the electrofluid dynamic (EFD) wind driven generator and performance estimates used to select the electrode spacing and other parameters are presented. Various spacings and tube sizes in different wind fields are considered to assess the effects of different parameters. Preliminary estimates indicate that the tower design will withstand head-on winds in excess of 100 mph (44 m/s) without damage. Many opportunities appear to exist to cut the cost of an EFD wind driven generator. Maintenance and downtime on this wind driven generator should be less than for a conventional system with many units having rotating parts. The EFD wind driven generator also does not require additional power conditioning for long line power transmission. It should be possible to produce EFD wind driven generators that are cost competitive with other methods of producing a high voltage dc power, once a charging system is developed. DOE

N84-31796# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
WIND ENERGY SYSTEMS FOR ELECTRIC UTILITIES: A SYNTHESIS OF VALUE STUDIES
Theresa Flaim and Susan Hock May 1984 110 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004520; SERI/TR-211-2318) Avail: NTIS HC A06/MF A01

The impact of wind energy conversion systems (WECS) on electric utilities is investigated. Eight major studies estimate the value of wind systems - the amount the utility could afford to pay for wind turbines with no cost or reliability penalties. While these reports contain a substantial amount of useful information, their results are difficult to compare and interpret directly. The basic value analysis methodology as it exists today is described. Unresolved issues are identified and the results from value analysis studies completed since 1979 are presented. DOE

N84-31797# Sandia Labs., Albuquerque, N. Mex.
A COMPARATIVE EVALUATION OF NEW LOW-COST ARRAY FIELD DESIGNS FOR GRID-CONNECTED PHOTOVOLTAIC SYSTEMS

H. N. Post and G. T. Noel (Battelle Columbus Labs.) 1984 7 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-010978; SAND-84-0053C; CONF-840804-4) Avail: NTIS HC A02/MF A01

New array field designs which have been developed to minimize the balance of system (BOS)cost for grid connected photovoltaic (PV) systems are examined. The designs which are appropriate for both intermediate and large size ground mounted flat plate arrays have significantly reduced the BOS cost. Key features of the array field BOS components including structures, foundations, intermobule connection, field wiring, and system grounding are identified for each design. Cost projections and cost experience on prototype and full scale installations are presented and compared. It is concluded that $0.50/W/sub p/ for the array field BOS is achievable for large size systems. DOE

N84-31798# AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien, Raumfahrt.
SILICON SOLAR CELLS: DEVELOPMENT AND QUALIFICATION OF THIN (50 TO 100 MICRON) AND LARGE AREA (5 cm X 5 cm) HIGH EFFICIENCY CELLS Final Report, Nov. 1982
Helmut Bebermeier Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 193 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-016; ISSN-0170-1339) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

Large area, high efficiency solar cells (T-HEC) with thickness between 100 and 150 micron were developed. The backside electric field (BSF) and backside reflector (BSR) technologies, and a combined BSFR system were applied. Cells 5 cm x 5 cm within the 200 micron thickness range were developed. Author (ESA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-31799# Turin Univ. (Italy). Dept. of Audiology.
NOISE AS A PUBLIC HEALTH PROBLEM, VOLUME 1 Final Scientific Report
G. Rossi Nov. 1983 21726 p Proc. of the 4th Intern. Congr., Turin, Italy, 21-25 Jun. 1983 2 Vol.
(Grant AF-AFOSR-0204-83)
(AD-A142412; EOARD-TR-84-08-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 06/5

The program for the conference was organized around the following eight working groups: (1) Noise-induced hearing loss, (2) noise and communication, (3) nonauditory physiological effects induced by noise, (4) influence of noise on performance and behavior, (5) noise-disturbed sleep, (6) community response to noise, (7) noise and animals, and (8) noise and other agents (physical and chemical). Each group provided a broad review of research in their respective area followed by invited papers on recent advances. At the end of each session either the chairman or a designated individual summarized the session and proposed directions for further study. Additional papers not falling under the above categories were presented in a separate session. Topics in this group included noise measurement, noise reduction, and expense of controlling noise. GRA

N84-31800# Turin Univ. (Italy). Dept. of Audiology.
NOISE AS A PUBLIC HEALTH PROBLEM, VOLUME 2 Final Scientific Report
G. Rossi Nov. 1983 21654 p Proc. of the 4th Intern. Congr., Turin, Italy, 21-25 Jun. 1983 2 Vol.
(Grant AF-AFOSR-0204-83)
(AD-A142413; EOARD-TR-84-08-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 06/5

Papers in Vol. 2 are presented with a brief introduction on the following topics: (1) influence of noise on performance and behavior; (2) noise disturbed sleep; (3) community response to noise; and (4) noise and animals. Recent advances and future direction are cited for each conference topic. GRA

N84-31801# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
ENVIRONMENTAL AND WATER QUALITY OPERATIONAL STUDIES. FLUOROMETRIC TECHNIQUES FOR TRACING RESERVOIR INFLOWS Final Report
M. C. Johnson Apr. 1984 50 p
(AD-A143135; WES/IR/E-84-1) Avail: NTIS HC A03/MF A01 CSCL 13/2

A reservoir's storage capacity, trophic state, and water quality are affected by tributary inflows which transport suspended and dissolved materials into and through the reservoir. The impact these materials have on reservoir and release water quality depends on how the inflow moves through and mixes within the reservoir. The movement of the inflow in a reservoir is often influenced by such factors as irregular morphometry, variable stratification, and engineering activities (e.g., preimpoundment clearing of trees, submerged cofferdams, and project operation). A reliable means of determining how inflows move and mix within a reservoir is to conduct field investigations using a fluorescent dye as a tracer. This report presents a methodology for conducting such a study. Included is information on the characteristics of fluorescent dyes, the principles and equipment of field fluorometry, methods for properly marking an inflow with dye, sampling methods, and guidance on data analysis. GRA

N84-31802# Texas A&M Univ., College Station. Dept. of Civil Engineering.
ENVIRONMENTAL IMPACT RESEARCH PROGRAM. AN IMPLICIT, WIGGLE-FREE, AND ACCURATE UPSTREAM FINITE-DIFFERENCE ALGORITHM FOR THE 1-DIMENSIONAL TRANSPORT-DIFFUSION EQUATION Final Report
D. R. Basco Jun. 1984 57 p
(Contract DACW39-81-M-4377)
(AD-A143141; WES/MP/E-84-4) Avail: NTIS HC A04/MF A01 CSCL 08/8

A stable, accurate, and robust finite-difference algorithm has been successfully developed for engineering solution of the one-dimensional transport-diffusion equation. It is implicit and accurate to a higher order through removal of truncation errors, and uses quadratic upstream weighted differencing of the advection term to eliminate wiggle instabilities. Patterned after the explicit scheme, the implicit method essentially doubles the useful, stable range of application with comparable accuracy. Because of these significant improvements for one-dimensional problems, it is strongly recommended that the implicit method be extended to two dimensions. Author (GRA)

N84-31803# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
URBAN AND LOCAL SOURCE EFFECTS ON PRECIPITATION CHEMISTRY
Frederick W. Lipfert, Leonard R. Dupuis, and Lisa M. Alvarez Mar. 1984 23 p refs Presented at the Air Pollution Control Assoc. Ann. Meeting, San Francisco, 24-29 Jun. 1984
(Contract DE-AC02-76CH-00016)
(DE84-011848; BNL-34565-Rev-1; CONF-840612-9-Rev-1) Avail: NTIS HC A02/MF A01

Precipitation chemistry measurements from the literature are compared in order to deduce the effects of local, urban and point sources on the patterns of concentrations in wet deposition. The hypothesis to be evaluated is that excess urban or local wet deposition will be related proportionally to local air quality. Empirical relationships are developed from these data which show consistent effects in wet SO4(--), and Ca(++) concentrations due to urban sources. The urban excess in SO4(--), with respect to regional background, is well correlated with SO2 air quality and emission

density. Excess Ca(++) is related to the non-sulfate portion of TSP air concentrations. Downwind of local sources, excess concentrations fall off more or less linearly up to 50 to 100 km from the source; but the important question is the function of source emissions which is deposited locally. Based upon the empirical relationships established between excess urban and point source wet SO4(--) and local SO2 air quality, a simple algorithm is developed which relates the fraction deposited locally to the air quality impact of the source and the source strength. The algorithm suggests that the air quality impact is dominant over the source strength, which is in qualitative agreement with other studies in the literature regarding the fractional deposits for low-stack sources and conversely for higher-stack sources. DOE

N84-31804# Argonne National Lab., Ill.
TEN-YEAR FORECASTS OF WATER QUALITY IN LAKE MICHIGAN USING A DETERMINISTIC EUTROPHICATION MODEL
B. M. Lesht Mar. 1984 43 p refs
(Contract W-31-109-eng-38)
(DE84-011425; ANL/ER-84-2) Avail: NTIS HC A03/MF A01

A dynamic, deterministic lake eutrophication model was used to forecast changes in Lake Michigan water quality over a ten-year simulation period. Emphasis was placed on changes in epiliminon phytoplankton biomass and in whole-lake total phosphorus concentration in response to changes in input phosphorus loads and to variations in winter conditions. Constant-condition simulations corresponding to current, increased, and reduced loads and to mild, average, and severe winters were used to establish bounds for the projected changes in water quality. Monte Carlo-types simulations were used to estimate the variance associated with the projections. Given the assumptions and limitations inherent in the modeling process, water quality in Lake Michigan is projected to improve slightly (reduced concentrations of phytoplankton and total phosphorus) over the next ten years. Year-to-year variations are significant, however, and will depend on loading and winter conditions. The variation in the projected values associated with the assumed fluctuations in loads and winter conditions is approximately 20 percent. DOE

N84-31805# Rijksdienst voor de Ijsselmeerpolders, Lelystad (Netherlands).
THE USE OF AQUATIC PLANTS TO PURIFY WASTE WATER IN RECREATIONAL WATERS [HET GEBRUIK VAN WATERPLANTEN VOOR DE ZUIVERING VAN AFVALWATER IN RECREATIEGEBIEDEN]
R. W. Greiner and J. deJong 1984 38 p refs In DUTCH; ENGLISH summary Presented at 35th Intern. Studiedagen Cebedeau, 24-26 May 1982
(Rept-226; B8469547) Avail: NTIS HC A03/MF A01

Waste water treatment by biological means is discussed. In recreational areas the production of waste water is irregular. In several cases the distance between recreational areas and existing sewage treatment plants in neighboring villages or towns is too long to make transport feasible. Any alternative treatment method for such a situation should fulfil the following requirements: easy to operate, low installation and building costs, low operation costs, insensitive to fluctuating loads, and good purification results. Ponds containing bullrushes or reeds, and infiltration ponds containing reeds can fulfil these requirements. Under optimum conditions 150 cum can be purified per day and par ha. The system is sensitive to overload. The choice of a system strongly depends on the geohydrological situation. Author (ESA)

N84-31806# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
US EPA (ENVIRONMENTAL PROTECTION AGENCY) REGIONAL OXIDANT MODEL, BACKGROUND AND OVERVIEW
K. L. Schere and N. C. Possiel (NOAA) Jun. 1984 19 p refs
(PB84-201680; EPA-600/D-84-155) Avail: NTIS HC A02/MF A01 CSCL 04A

The development of a photochemical model capable of simulating regional transport of ozone and its precursors is the focus of an extensive program now in progress at the EPA. This model, the regional oxidant model (ROM) is designed for use in evaluating the effectiveness of various control strategies needed to provide for attainment of the ozone NAAQS. The model is to be evaluated for the Northeast U.S. where various studies demonstrate the occurrence of widespread episodes of high ozone concentrations. The types of issues that could be addressed using the Regional Oxidant Model are highlighted and the structure of this model is described. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-31807 Wisconsin Univ., Madison.
LIDAR OBSERVATIONS AND MODELING OF ATMOSPHERIC MIXED LAYER ENTRAINMENT PROCESSES Ph.D. Thesis
Reinout Boers 1983 300 p
Avail: Univ. Microfilms Order No. DA8402010

Lidar measurements of the atmospheric mixed layer height, the entrainment zone, wind speed, direction and turbulence were used to test parameterized entrainment models for mixed layer growth rate. Six case studies of clear air convection over flat terrain in central Illinois are presented. When the model coefficients are optimized with the data the model predictions are excellent under convective conditions. Under conditions with shear the shapes of the curves of the model predictions depart from the shapes of the observed mixed layer height curves. It was investigated whether this was due to shear driven entrainment at the top of the mixed layer. A new entrainment model was developed that limits the use of shear produced turbulence at the top of the mixed layer at the top of the mixed layer. The new model gave only limited improvement. Dissert. Abstr.

N84-31808 Wyoming Univ., Laramie.
A 1-DIMENSIONAL TIME DEPENDENT MODEL OF THE STRATOSPHERIC AEROSOL Ph.D. Thesis
James Michael Kiernan 1983 146 p
Avail: Univ. Microfilms Order No. DA8408752

A computer solution of the one-dimensional time dependent transport equation for the stratospheric aerosol layer is described. The core of the model includes vertical transport by eddy diffusion and sedimentation, and particle creation and annihilation through heteromolecular gas-particle interaction and Brownian coagulation. The model evaluates the differential size distribution (number of aerosol per unit radius per unit volume) and the sulfuric acid vapor concentration (molecules per unit volume). The partial differential equation for conservation of mass, along with the boundary condition, is separated into a coupled system and integrated over time using Gear's method. The model reproduces the most significant physical properties of the aerosol layer, including the vertical concentration profile and size distribution. It is useful (within the limitations of one-dimensional modeling) in estimating effects on perturbations such as volcanic eruptions on the layer.
Dissert. Abstr.

N84-31809 Illinois Univ., Urbana-Champaign.
THEORETICAL STUDIES OF THE PULSAR MAGNETOSPHERE Ph.D. Thesis
Richard Francis Martin, Jr. 1983 167 p
Avail: Univ. Microfilms Order No. DA8409994

Quantitative models of the plasma magnetosphere surrounding a rotating, magnetized, neutron star (pulsar) are studied. Both the aligned model (rotation axis parallel to magnetic axis) and the nonaligned model are considered. An energy analysis is performed on two explicit models of the aligned rotator due to Jackson. The unknown parameters of these models are determined by calculating the minimum total energy states of the models. The minimum

energy analysis favors states with extended, dynamically active magnetospheres with a high degrees of corotation. The minimum energy states are the only states where a power balance can be achieved. Consideration of a local power balance condition and dissipative flows in the magnetosphere shows that neither model is completely self consistent, but one is considerably better than the other. Properties of both models are discussed. Dissert. Abstr.

N84-31810 Stanford Univ., Calif.
GEOLOGY, PETROLOGY AND TECTONIC SIGNIFICANCE OF THE MESOZOIC PALEOCEANIC TERRANES OF THE VIZCAINO PENINSULA, BAJA CALIFORNIA SUR, MEXICO Ph.D. Thesis
Thomas Edward Moore 1984 418 p refs
Avail: Univ. Microfilms Order No. DA8408333

The Viscaino Terrane, which is the most outboard terrane of mainland Baja California, can be divided into three principal terranes on the Vizcaino Peninsula. The structurally lowest is the disrupted composite Puerto Nuevo terrane which is represented by metamorphosed blocks in a serpentinite-matrix melange. The Viscaino Norte terrane structurally overlies the Puerto Nuevo terrane along a low-angle contact. To the south, the Vizcaino Sur terrane exposes a sequence consisting of ophiolite, tuffaceous chart and limestone of the San Hipolito Formation of Late Triassic age. Based on the petrologic, geochemical, and stratigraphic characteristics, the ophiolites of the Vizcaino Norte and Vizcaino Sur terranes are interpreted to have been formed in one or more marginal basin island arc systems during the Late Triassic whereas the ophiolitic rocks of the Puerto Nuevo terrane most likely formed at a midocean ridge. The subsequent pre-Upper Jurassic island arc deposits of the terranes are entirely volcanogenic and biogenic and contain no evidence of close proximity to a cratonal source. It is suggested that for as much as 80 my, the terranes were probably not associated with a continental margin as a fringing island arc, but instead represent allochthonous fragments of a paleogeographically complex paleo-Pacific Ocean. Dissert. Abstr.

N84-31811 Stanford Univ., Calif.
GEOLOGY OF THE PORTRERILLOS DISTRICT, ATACAMA, CHILE Ph.D. Thesis
Steven Frederick Olson 1984 296 p
Avail: Univ. Microfilms Order No. DA8408341

The geology of the Potrerillos porphyry copper district records the patterns of marine sedimentation, volcanism, igneous intrusion, and deformation in the Andes of northern Chile from Jurassic to Recent times. Pre-Jurassic granitic and metamorphic basement is overlain by marine sedimentary and volcanic rocks of Jurassic-Lower Cretaceous age and continental volcanic rocks of Paleocene-Eocene age. Both the marine and continental volcanic sequences are much thicker on the western side of the district and pinch out abruptly over the center of the district. Timing of reverse faulting is bracketed between 32 and 12 m.y.b.p. The Potrerillos district appears to lie near the eastern margin of a major fault-bounded depression in which volcanic rocks accumulated between Jurassic and Paleocene times. Most of the Eocene-Oligocene porphyry copper deposits in northern Chile occupy similar regional stratigraphic and volcanic settings, and are proximal to major high-angle faults. The geology of the Potrerillos area suggests that these faults may have been active as normal faults in Jurassic-Paleocene time, later guided the emplacement of porphyry plutons, and were subsequently reactivated in Miocene-Recent times. Dissert. Abstr.

N84-31812 Colorado State Univ., Fort Collins.
RESPONSE OF ALLUVIAL RIVERS TO ACTIVE TECTONICS Ph.D. Thesis
Shunji Ouchi 1983 222 p
Avail: Univ. Microfilms Order No. DA8408916

In order to investigate effects of active tectonics on alluvial rivers, a series of experiments were performed on braided, meadering and confined straight channels, and examinations of alluvial rivers flowing through areas of surficial deformation were conducted. The experimental braided channel responded to anticlinal uplift across the channel with degradation and terrace formation in the central part of the uplift. A strongly braided pattern developed in the downstream reach, where aggradation and slope steepening occurred. With subsidence, aggradation in the central reach was the main response. A strongly braided pattern formed upstream, and transverse bars developed in downstream side of the subsidence axis. The experimental meandering channel responded to valley slope steepening with a sinuousity increase. Bank erosion and point-bar growth occurred downstream of the anticlinal axis and upstream of the synclinal subsidence. Based on experimental results and field examples, models of river response to two common types of active tectonic movements (anticlinal uplift and synclinal subsidence) were developed for different types of alluvial rivers. Dissert. Abstr.

N84-31813 Pennsylvania State Univ., University Park.
PETROGRAPHY AND DEPOSITIONAL ENVIRONMENT OF THE HERRIN (NO. 6) SEAM IN CENTRAL, EASTERN AND NORTHWESTERN ILLINOIS Ph.D. Thesis
Suzanne Jeannette Russell 1983 490 p
Avail: Univ. Microfilms Order No. DA8409091

Samples from nine mines in Illinois were described megascopically in terms of the lithotypes vitrain, clarain, duroclarain, clarodurain, durain, and fusain. Ten of the columns samples were also analyzed petrographically. The columns were divided into subsections based on the maceral content. Two characteristic seam profiles were identified. Samples from northwestern Illinois and from central Illinois have a profile consisting of alternating subsections of relatively inertinite-rich and inertinite-poor coal. Samples from eastern Illinois and from central Illinois have a profile of relatively inertinite-rich lower subsections and inertinite-poor upper subsections. All coal columns studied terminate upward in an inertinite-poor subsection. The coal petrography is believed to have been controlled by fluctuations in the water table during peat deposition which were caused either by variation in rainfall or by changes in sea level. Prior to the marine transgression which ended peat accumulation, the water table in the swamp rose everywhere within the study area. Dissert. Abstr.

N84-31814 Stanford Univ., Calif.
GEOLOGY AND GEOCHEMISTRY OF THE ARCTIC PROSPECT, AMBLER DISTRICT, ALASKA Ph.D. Thesis
Jeannie Marie Schmidt 1984 314 p refs
Avail: Univ. Microfilms Order No. DA8408352

The Arctic volcanogenic massive sulfide prospect is the largest known (40 million ton) deposit hosted by the low greenschist grade, latest Devonian Ambler Sequence of bimodal, basaltic and rhyolitic volcanic and volcanoclastic rocks, pelitic, graphitic and calcareous metasediments. Detailed field mapping, core logging, petrography, X-ray diffractometry, electron microprobe analyses and whole-rock major element analyses of hydrothermally altered rocks were used to determine the emplacement history and setting of sulfide deposition. Low greenschist grade metamorphism was essentially isochemical on a macroscopic scale, and preserved volcanic compositions, the major element chemistry of alteration and the compositions of individual metamorphic, alteration and relict igneous minerals. Mineralization at Arctic was formed along a synvolcanic fault in a tectonically and volcanically active basin within a rifted continental margin, possibly related to an actively spreading oceanic rift. Dissert. Abstr.

N84-31815 George Washington Univ., Washington, D.C.
THE QUATERNARY HISTORY AND STRATIGRAPHY OF THE CAPE FEAR RIVER VALLEY, NORTH CAROLINA Ph.D. Thesis
David Rugh Soller 1984 225 p
Avail: Univ. Microfilms Order No. DA8410492

Five terraces were identified in the lower Cape Fear River valley, in southeastern North Carolina. All terraces lie northeast of the Cape Fear River, decreasing in elevation and age toward the floodplain. Extensive dune fields and well-developed Carolina bays occur on all but the youngest terrace. Four terraces were indirectly dated by correlation with age-dated backbarrier beach complexes that are approximately 760, 200, 100, and, 35-50 thousand years

old. The fluvial sediments are predominantly sandy, and are capped with silt or clay overbank deposits. Dunes commonly overlie the fluvial sediments. In the older deposits surrounding the valley, hornblende, epidote, and feldspar are depleted in the upper portion of the weathering profile. The fluvial samples in contrast, do not exhibit a similar upward depletion; however, the older terraces have fewer labile minerals than the younger terraces, because of the longer period of exposure to intrastratal solution. The clay mineral suite is constant in the fluvial sections, composed of kaolinite, mixed-layer expandable clays and minor verminculite. The mineralogy of dune samples is much different, containing a mature assemblage similar to the weathered upland samples (vermiclite, kaolinite, and gibbsite). Dissert. Abstr.

N84-31816 Pennsylvania State Univ., University Park.
THE DEPOSITIONAL ENVIRONMENTS AND PETROGRAPHY OF THE STIRLING QUARTZITE DEATH VALLEY REGION, CALIFORNIA AND NEVADA Ph.D. Thesis
William Earl Wertz 1983 210 p
Avail: Univ. Microfilms Order No. DA8409113

The Stirling Quartzite is a relatively unmetamorphosed, predominantly clastic formation of latest Precambrian age which accumulated during the early stages of a Cordilleran miogeocline. It is extensively exposed throughout the Death Valley region of California and Nevada. The formation was divided into fine members A-E. The stratigraphic arrangement of the members is such that the lower and upper halves of the formation are approximate mirror images of each other with respect to their physical characteristics. The overall coarse to fine to coarse grain-size pattern which characterizes the stratigraphy of the Stirling Quartzite reflects a change from a relatively high energy depositional environment to a relatively low energy one and back again. Comparison of the Stirling paleocurrent trends with a paleogeographic map of the Pahrump Group (Wright and others, 1974), suggests that the structural template which is associated with the Amargosa aulacogen also influence the paleogeography of the Stirling Quartzite. Dissert. Abstr.

N84-31817 Illinois Univ., Urbana-Champaign.
MICROFACIES, DEPOSITIONAL ENVIRONMENTS AND DIAGENESIS OF THE AMAPA CARBONATES (PALEOCENE - MIDDLE MIOCENE) FOZ DO AMAZONAS BASIN, OFFSHORE NORTHEAST BRAZIL Ph.D. Thesis
Breno Wolff 1984 195 p
Avail: Univ. Microfilms Order No. DA8409851

The carbonate section of 18 wells drilled offshore northeast Brazil was studied. The Amapa Formation consists of a carbonate platform adjacent to a landward fluvio-deltaic system which periodically prograded over the platform. The Amapa carbonates were divided into 22 distinct microfacies combined into two depositional models separated by a major unconformity. The paleoenvironmental reconstruction of model 1 (Paleocene to Early Eocene) consists of five juxtaposed microfacies classified into three environmental subdivisions. Model 2 (Middle Eocene to Middle Miocene) comprises 17 microfacies classified into seven subenvironments. A sequence of twelve diagenetic stages was established for model 1 based on textural relationships. The most important reservoir rocks in this model are due to primary porosity locally reduced by later cementation. These potential oil reservoirs, which locally reach 20% porosity consist of lagoonal deposits of dasycladacean calcarenites with common intraparticle and interparticle porosity. The diagenetic sequence determined for model 2 comprises 13 distinct events. The best reservoirs in this model are due to secondary porosity generated by both selective and nonselective dissolution, the underground freshwater circulation being the main control factor of porosity generation. Dissert. Abstr.

N84-31818 Stanford Univ., Calif.
RETROGENESIS OF THE BASAL ZONE OF THE STILLWATER COMPLEX, MONTANA Ph.D. Thesis
Michael Leslie Zientek 1984 268 p
Avail: Univ. Microfilms Order No. DA8408383

A descriptive model of the Basal zone that helps decipher the early emplacement and crystallization history of the Stillwater Complex, an Archean ultramafic to mafic layered instrusion, and constrains the processes that led to accumulation of magnetic Fe-Cu-Ni sulfides are presented. The major conclusions follow: (1) an episode of sill and dike injection, accompanied by emplacement of a significant proportion of the sulfides as an immiscible liquid, preceded intrusion of the Stillwater Complex; (2) sulfide liquid exsolution and accumulation continued after emplacement of the Stillwater intrusion; (3) multiple injections of high-magnesium magma with slightly different compositions produced cumulates in the Basal cumulate member showing a variety of crystallization sequences and discontinuities in the cryptic trend defined by orthopyroxene compositions; and (4) there is no evidence for extensive contamination of the Stillwater magma by partial melts of the surrounding metasedimentary rocks for assimilation of metasedimentary sulfur. Dissert. Abstr.

N84-31819 California Inst. of Tech., Pasadena.
SEISMICITY AND CRUSTAL STRUCTURE STUDIES OF SOUTHERN CALIFORNIA: TECTONIC IMPLICATIONS FROM IMPROVED EARTHQUAKE LOCATIONS Ph.D. Thesis
Edward John Corbett 1984 247 p
Avail: Univ. Microfilms Order No. DA8408527

The 5.1 M (sub L) Santa Barbara earthquake of 13 August 1978 was located 3 km southeast of Santa Barbara at a local depth of 12.7 km. The temporal spatial development of the aftershock zone may indicate that the initial rupture plane was considerably smaller than that of the eventual aftershock zone. The aftershock hypocenters outline a nearly horizontal plane (dipping 15 deg or less) at 13 km depth and the preferred local mechanism indicates north over south thrusting. These observations are consistent with a tectonic model in which much of the slip occurred on a nearly horizontal plane, and this earthquake may be taken as evidence for mid-crustal horizontal shearing in the western Transverse Ranges. To further test the decollement hypothesis, Caltech catalog locations were reviewed to determine the depth distribution of earthquakes in the Transverse Ranges. Dissert. Abstr.

N84-31820 Texas A&M Univ., College Station.
ORIGIN AND EVOLUTION OF THE WEST PHILIPPINE BASIN Ph.D. Thesis
Chao-Shing Lee 1983 135 p
Avail: Univ. Microfilms Order No. DA8408448

Analyses of the compiled magnetic, bathymetric and seismic reflection data show that the West Philippine Basin was formed by seafloor spreading from the Central Basin Spreading Center in two distinctly different spreading phases, before and after subduction was initiated along the Palau-Kyushu trend at about 45 Ma B,P. These episodes are recognized by differences in the strike of magnetic lineations, spreading rates, density and strike of fracture zones, and basement relief. Relative to the present orientation of magnetic and fracture zone trends, it is found that from 60-45 Ma B,P, the West Philippine Basin crust was created by NE-SW symmetric spreading about the proto-Central Basin Spreading Center at a half rate of 44 mm/a. Dissert. Abstr.

N84-31821 Pennsylvania State Univ., University Park.
A THREE-DIMENSIONAL RAY METHOD AND ITS APPLICATION TO THE STUDY OF WAVE PROPAGATION IN CRUSTAL STRUCTURE WITH CURVED LAYERS Ph.D. Thesis
Jia Ju Lee 1983 282 p
Avail: Univ. Microfilms Order No. DA8409060

A three dimensional ray method is developed for studying wave propagation in complex structures involving curved boundaries. It assumes elastic wave propagation and enables calculation of three components of ground motion. To construct the solutions, a 3-D ray tracing scheme is designed to track all geometric rays in the model. The method of principal curvature is developed to compute geometric spreading of rays across nonplanar boundaries. This method employs phase matching at model interfaces and analysis of the wavefront surface metric as the ray propagates through the model. It is an elegant way to examine the characteris-

tics of three dimensional caustics. The validity of the ray technique is substantiated by checking against two numerical methods and the method of glorified optics by using a 2-D canonical basin model. Wave behaviors in the 2-D basin and a 3-D circular basin model are investigated in detail. Dissert. Abstr.

N84-31822 Connecticut Univ., Storrs.
NONLINEAR INVERSE METHODS APPLIED TO INTERPRETING GRAVITY ANOMALIES PRODUCED BY MULTI-INTERFACED GEOLOGIC BODIES Ph.D. Thesis
Jeng-Jong Pan 1984 114 p
Avail: Univ. Microfilms Order No. DA8408096

Nonlinear inverse methods are used to determine shapes of source bodies directly from observed gravity anomalies when density distributions are known. Two nonlinear inverse methods are applied, the nonlinear optimization and the least squares methods, which are here grouped under optimization methods. For an initially assumed model of a geological structure, optimization methods obtain values for source parameters by iterative adjustments that minimize a nonlinear objective function. Optimization methods applied in analyzing gravity anomalies produced by multiinterfaced structures can (1) provide high resolution for simple structures or, at least, find gross models for very complex structures in short computer time, (2) simulate various geological models where the corresponding objective function are defined, and (3) indicate available constraints placed on some parameters. Other types of geophysical inverse problems are similarly analyzed by optimization methods. Dissert. Abstr.

N84-31823 California Univ., Los Angeles.
OBSERVATIONS OF LONG-PERIOD MOTIONS OF THE EARTH AT THE SOUTH POLE Ph.D. Thesis
Paul Anthony Rydelek 1983 123 p
Avail: Univ. Microfilms Order No. DA8409234

Vertical gravity data from 6.3 years of observations at the Amundsen-Scott South Pole Station are used to investigate the response of the Earth at periods much longer than the usual seismic or free-mode band of oscillations. At the Poles the vertical components of the short-period diurnal and semidiurnal tides shoul in theory vanish while the long-period tides attain their maximum amplitudes. The data are analyzed to determine the gravimetric factors and phase angles of the lunar long-period solid Earth tides. For the largest component, the fortnightly tide, a precise estimate of the gravimetric factor and a small but significant phase lead indicates the influence of a non-equilibrium fortnightly oceanic tide on the Earth tide at the South Pole. A maximum entropy method of spectral analysis on the longest ungapped 3 year record was made to determined the response of the Earth to the solar long-period tides. A spectral peak was observed with semiannual periodicity. Small diurnal and semidiurnal residual tides are observed which are believed to be caused by a non-axisymmetric distribution of the mass of the Earth, including the oceans.
Dissert. Abstr.

N84-31824 Texas A&M Univ., College Station.
CONVERGENCE TECTONICS OF THE PERU TRENCH: 8 DEG S - 15 DEG S LATITUDE Ph.D. Thesis
Waris Ejaz Khan Warsi 1983 182 p
Avail: Univ. Microfilms Order No. DA8408495

The tectonics of convergence along the Peru Trench with the specific objective to gain insight into the sediment subduction process are discussed. Analysis of GLORIA (Geological Long Range Incined Asdic) long-range side-scan sonar and other geophysical data show that the Peru Trench is a site f long term sediment subduction where bending-induced normal faulting of the Nazca plate plays a key role. The sediments are continually removed from the trench axis region by their inclusion in the normal fault-defined void spaces, such as grabens. In the process of subduction, the sediments are often offscraped, folded and kneaded temporarily at the base of the shoreward trench slope. The subduction complex comprising such sediments is narrower than 20 km in the region and its volume remains more or less constant due to regular removal of its contents along with the subducting Nazca plate. It is also believed that the morphology of the subducting plte is responsible for subduction erosion of the South American plate, where the horst blocks cause tectonic erosion by abrasion and the grabens provide a mechanism for removal of the eroded material. Dissert. Abstr.

N84-31825 Colorado Univ., Boulder.
GEOCHEMISTRY OF OIL SHALE LEACHATES AND INTERACTION WITH GEOLOGIC SUBSTRATES, PICEANCE CREEK BASIN, COLORADO Ph.D. Thesis
Esmail Esmaili 1983 369 p
Avail: Univ. Microfilms Order No. DA8408031

Production of shale oil generates large amounts of retorted and unretorted waste shale, to be disposed of in the canyons near retorting facilities. Leachates were generated in the laboratory by shaker and column experiments, using a newly retorted TOSO II shale. Batch type and flowthrough column techniques were employed to study the interactions of the leachates with the substrate soil and bedrock samples rom a proposed disposal site. The substrate materials showed a good buffering capacity for lowering the leachates pH. The geologic materials also provided almost complete removal of Al, strong removal of As, good removal of F and Na, but limited removal of Mo and B, and insignificant removal of Cl and SO. The high concentrations of SO in the leachates and its mobility make it a particularly attractive tracer of the leachate movement through the environment. Dissert. Abstr.

N84-31826 Colorado Univ., Boulder.
GEOCHRONOLOGY, PALEOMAGNETISM AND PETROLOGY OF THE UPPER CENOZOIC BRUNEAU FORMATION IN THE WESTERN SNAKE RIVER PLAIN, IDAHO Ph.D. Thesis
Mohammad-Hassan Amini 1983 236 p
Avail: Univ. Microfilms Order No. DA8408011

The combined application of potassium-argon and paleomagnetic techniques revealed an understanding of the sequence of geologic events during the last 2.2 m.y. in the western part of the Snake River Plain. Two factors introduce large errors in the whole-rock K-Ar dating of fine-grained, glass-rich, geologically young Snake River basalts: a low potassium content which is not uniformly distributed; and the presence of large amounts of extraneous, occluded and atmospheric argon. Therefore, paleomagnetism has been applied as a supporting technique. Basalts of the Bruneau Formation display field, petrographic, and petrologic characteristics similar to other Snake River basalts. Olivine has undergone no reaction with the residual liquid, and the sole pyroxene is a Ca-rich augite. They contain both olivine and hypersthene in the norm and display characteristics transitional between tholeiitic and alkali basalts. Accordingly they have been classified as hypersthene-normative alkalic basalts. Dissert. Abstr.

N84-31827 Illinois Univ., Urbana-Champaign.
MICROFACIES, DEPOSITIONAL MODELS AND DIAGENESIS OF LAGOA FEIA FORMATION (LOWER CRETACEOUS), CAMPOS BASIN, OFFSHORE BRAZIL Ph.D. Thesis
Renato Tadeu Bertani 1984 214 p
Avail: Univ. Microfilms Order No. DA8409747

The Lagoa Feia Formation consists of the sediments deposited during the rift valley stage of the Campos Basin, varying from 200m to more than 1500m in thickness. In this unit seventeen microfacies were recognized, grouped into four main sequences, respectively dominated by terrigenous supplies, ostracods, pelecypods, and basic volcaniclastics. The vertical sequence of microfacies and the associations of syndepositional diagenetic minerals were used to reconstruct the general environment of deposition. Five diagenetic stages were recognized. Pelecypod rich microfacies present the highest potential for development of intraparticle and moldic secondary porosity. Two types of fabric selective porosity were experimentally developed in low porosity samples under simulated burial conditions. Intercrystal microporosity was formed by preferential dissolution of micrite size calcite compared to coarse calcite crystals of sparite and neomorphosed bioclasts, and intraparticle porosity was developed in pelecypod

shells by selective dissolution of neomorphic calcite compared to sparite cement. Dissert. Abstr.

N84-31828 Stanford Univ., Calif.
THE PETROLOGY AND GEOCHEMISTRY OF THE YERINGTON BATHOLITH AND THE ANN-MASON PORPHYRY COPPER DEPOSIT, WESTERN NEVADA Ph.D. Thesis
John Hook Dilles 1984 462 p
Avail: Univ. Microfilms Order No. DA8408281

Field, petrologic, and geochemical data presented herein constrain the origin of porphyry copper mineralization in the Jurassic Yerington batholith. Three major units were emplaced: granodiorite, quartz monzonite, and porphyritic quartz onzonite (PQM), including porphyry. Two concordant U-Pb zircon dates indicate the batholith was emplaced within one million years. Phase petrology, stable isotopes, and both iron-titanium oxide and biotite compositional data indicate each plutonic unit crystallized while water-saturated at relatively high oxygen fugacities to the solidus, and that minerals reequilibrated during cooling in the presence of a magmatic water phase. Hydrothermal alteration affected rock at the Ann-Mason porphyry copper deposit. Most of the copper in the deposit probably came from a high salinity, water-rich magmatic fluid that separated from the crystallizing PQM/quartz monzonite porphyry magma, ut that up to 16% may have derived from leaching during sodic-calcic alteration. Dissert. Abstr.

N84-31829 Wyoming Univ., Laramie.
DEPOSITIONAL ENVIRONMENT AND PETROLOGY OF THE MEDICINE PEAK QUARTZITE (EARLY PROTEROZOIC), SOUTHERN WYOMING Ph.D. Thesis
Andrew James Flurkey 1983 152 p
Avail: Univ. Microfilms Order No. DA8408761

The Medicine Peak Quartzite consists of a complex interfingering of quartzite, sericitic quartzite, and quartz pebble conglomerate. Kyanite, feldspar, muscovite, kaolinite, pyophylite, and heavy minerals are present sporadically. The kyanite and pyrophylite are products of the metamorphism of kaolinite and/or diaspore. Sericite formed from the alteration and metamorphism of feldspar and clay minerals. Based on the mineral assemblage of quartz pyrophylite-kyanite in the Medicine Peak Quartzite and the blotite zone, the temperature during metamorphism reached approximately 400 C with a minimum pressure of 2.6 kb. Paleocurrent studies indicate that sediment transport was largely to the southwest. Paleocurrent data facies analyses, and previous tectonic studies indicate that the Heart Formation Medicine Peak Quartzite Lookout Schist succession is a regressive transgressive fluvial/deltaic sequence deposited in a northeast southwest trending rift valley. The Heart Formation and Lookout Schist contain prodelta basin and delta front slope deposits. The uppermost portion of the Medicine Peak Quartzite contains shallow marine and subtidal delta plain sediments. The bulk of the quartzite consists of a complex interfingering of braided fluvial and tide dominated delta plain sediments. Dissert. Abstr.

N84-31830 Wyoming Univ., Laramie.
RECENT EOLIAN ACTIVITY AND PALEOCLIMATE FLUCTUATIONS IN THE FERRIS LOST SOLDIER AREA, SOUTH-CENTRAL WYOMING Ph.D. Thesis
David Russell Gaylord 1983 303 p
Avail: Univ. Microfilms Order No. DA8408745

The Ferris Dune Fields were examined. Sand dunes are especially valuable in paleoclimate reconstructions because they: (1) bury and preserve datable materials and artifacts; (2) respond to even subtle changes in wind velocity and direction as reflected both in external morphology and internal structures; and (3) remain unconsolidated, making them amenable to easy textural and compositional examination. The valley of Clear Creek in the Ferris Dunes reveals a relatively continuous Holocene section of interbedded dune and interdunal pond deposits. Radiocarbon dates from the interdunal pond strata at Clear Creek, theoretical sand dune migration rates, compositional analysis of periglacial sand wedges, and relative dating of actively migrating parabolic dunes reveals a general sequence of geologic-climatic events that affected the Ferris-Lost Soldier area. The most recent major reactivaton of dunes occurred approximately 290 years ago. Dissert. Abstr.

N84-31831 Columbia Univ., New York.
VOLCANISM, PLUTONISM, AND SEDIMENTATION IN A LATE DEVONIAN SUBMARINE ISLAND-ARC SETTING, NORTHERN SIERRA NEVADA, CALIFORNIA Ph.D. Thesis
Richard Eric Hanson 1983 354 p
Avail: Univ. Microfilms Order No. DA8327226

The stratigraphy, sedimentology, and volcanology of the Upper Devonian Sierra Buttes Formation in the northern Sierra Nevada of California was studied. The stratigraphy of the formation and adjacent units as defined by earlier workers is revised, and new Frasnian-Famennian megafossils and conodonts are discussed. Abundant dacitic to rhyolitic pillows indicate an unusually low viscosity for the silicic magma, due to retention of volatiles in the melt under submarine conditions. The Upper Devonian Bowman Lake batholith, a crudely concentrically zoned, composite tonalitic-trondhjemitic-granodirotic-granitic epizonal pluton that forecefully intruded the basement to the Upper Devonian arc contemporaneously with deposition of the Sierra Buttes Formation at higher levels is also investigated. Dissert. Abstr.

N84-31832 Illinois Univ., Urbana-Champaign.
ARGILLIC ALTERATION ASSOCIATED WITH THE AMETHYST VEIN SYSTEM, CREEDE MINING DISTRICT, COLORADO Ph.D. Thesis
Duane Gale Horton 1983 463 p
Avail: Univ. Microfilms Order No. DA8409955

The Amethyst Vein System is an epithermal Ag-Pb-Zn-Cu-Au deposit in the Creede mining district, southwest Colorado. Silicification and argillization are the two dominant facies of hydrothermal alteration associated with the deposit. Most silicification occurs in the intermediate and deep levels of the system and most argillized rock occurs high in the system. It is shown that the hydrothermal system at Creede is similar in several respects to some modern geothermal systems. Illite/smectite from the Amethyst system shows systematic zoning with respect to position in the deposit of polytypes, layer-charge density, the composition of expandable interlayers and the composition of 2:1 octahedral sheets. Illite/smectite from intermediate levels in the mine has the 1M polytype. Higher in the system, illite/smectites are either physical mixtures of both 1M and 3T polytypes or, for a few samples from the shallowest level, are solely 3T. Illite/smectite from the deeper parts of the system is Al-rich and has a higher layer-charge density relative to clays collected from shallower levels in the mine. Illite/smectite from Bachelor Mountain tuff is generally illite/1-H2O smectite. Dissert. Abstr.

N84-31833 Florida State Univ., Tallahassee.
THE NEOGENE STRATIGRAPHY OF THE CENTRAL FLORIDA PANHANDLE Ph.D. Thesis
Paul Francis Huddlestun 1984 245 p
Avail: Univ. Microfilms Order No. DA8408945

Two groups, 10 formations, and one member are recognized and described from the Neogene strata of the central Florida panhandle. The Alum Bluff Group is redefined on the basis of lithology. Portions of three structural features are present in the central Florida panhandle. At least seven periods of deposition and at least seven periods of nondeposition are recognized. The periods of deposition include the following biostratigraphically equivalent formations: (1) undifferentiated Chickaswahayan deposits - Suwannee limestone of late Oligoene, Chattian age; (2) Chipola Formation - equivalent limestone of early Miocene, Burdigalian age; (3) Bruce Creek Limestone - Langhian age; (4) Whites Creek Member - late Langhian and early Serravallian age; (5) middle and upper Shoal River Formation - Serravallian age; (6) Choctawhatchee Formation of late Miocene, Tortonian age; and (7) Intracoastal Limestone - phosphoritic sand unit of Pliocene, late Zanclian to Piacenzian age. There is evidence that an eighth, late Pleistocene period of deposition is present. Dissert. Abstr.

N84-31834 State Univ. of New York, Binghamton.
GEOLOGY OF THE GUALAN AND SOUTHERN SIERRA DE LAS MINAS QUADRANGLES, GUATEMALA Ph.D. Thesis
Kent Raymond Johnson 1984 355 p
Avail: Univ. Microfilms Order No. DA8408394

The Gualan and Sierra de las Minas quadrangles straddle the Motagua Valley fault zone, a major southerly convex fault zone of Nuclear Central America, and the active transform boundary between the North American and Caribbean plates. Two distinctly different pre-Mesozoic metamorphic basement complexes are exposed in the area. The Chuacus Group crops out north of the Motagua Valley. The Las Ovejas Complex crops out south of the valley. Early Tertiary rift basins received clastic deposits of the Subinal Formation. Concurrently, hornblende diorite and La Union pluton granodiorites intruded the Las Ovejas. Sinistral strike slip motion began in the Miocene and the Junquillo pull apart basin formed between the Cabanas and Jubuco faults along the south side of the valley. Las Ovejas Complex rocks between these faults were mylonitized during the faulting. Southerly derived Plio-Quaternary alluvial fans in the Junquillo basin have been offset left laterally as much as 15 to 20 km from their source areas by the Jubuco fault. A shift in the active trace of the Jubuco fault led to uplift of the western Junquillo basin during the Quaternary. The Cabanas fault is now the active plate boundary. Dissert. Abstr.

N84-31835*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Monthly Progress Report, 14 May - 13 Jun. 1984
Jun. 1984 9 p
(Contract NAS8-35594)
(NASA-CR-171117; NAS 1.26:171117) Avail: NTIS HC A02/MF A01 CSCL 04A

Computer graphics software was developed to examine in detail the simulated variations of aerosol size distribution due to gravitational sedimentation effects. This examination contributes to understanding the effect of aerosol microphysical processes occurring in an aerosol plume which undergoes transport in the atmosphere. Results are presented in graphical form. Future research directions are outlined. R.S.F.

N84-31836*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Monthly Progress Report, 14 Apr. - 13 May 1984
21 May 1984 6 p refs
(Contract NAS8-35594)
(NASA-CR-171116; NAS 1.26:171116) Avail: NTIS HC A02/MF A01 CSCL 04A

A ten-layer model of the effect of gravitational sedimentation on aerosol size distribution is discussed briefly. The model was tested with data collected previously for a Saharan dust plume over the Atlantic Ocean. Future research directions are outlined. R.S.F.

N84-31837*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Monthly Progress Report, 14 Jun. - 13 Jul. 1984
20 Jul. 1984 8 p
(Contract NAS8-35594)
(NASA-CR-171127; NAS 1.26:171127) Avail: NTIS HC A02/MF A01 CSCL 04A

Several areas of research which contribute to the development of a global model for atmospheric backscatter at CO2 wavelengths are discussed briefly. A computer program was written which fits a bimodal log-normal model to an aerosol size distribution. A ten-layer atmospheric model used to study the effect of gravitational sedimentation on aerosol particle size distribution was expanded by incorporating the transport effect due to vertical diffusion. Future research directions are outlined. R.S.F.

N84-31838*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONSERVATION LAWS OF WAVE ACTION AND POTENTIAL ENSTROPHY FOR ROSSBY WAVES IN A STRATIFIED ATMOSPHERE
David M. Straus Dec. 1983 43 p refs
(NASA-TM-86058; NAS 1.15:86058) Avail: NTIS HC A03/MF A01 CSCL 04A

The evolution of wave energy, enstrophy, and wave motion for atmospheric Rossby waves in a variable mean flow are discussed from a theoretical and pedagogic standpoint. In the absence of mean flow gradients, the wave energy density satisfies a local conservation law, with the appropriate flow velocity being the group velocity. In the presence of mean flow variations, wave energy is not conserved, but wave action is, provided the mean flow is independent of longitude. Wave enstrophy is conserved for arbitrary variations of the mean flow. Connections with Eliassen-Palm flux are also discussed. Author

N84-31839# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NIGHTTIME ENHANCEMENTS IN THE TEC AND MAGNETIC STORM RESPONSE OF THE TROPICAL F-REGION OVER BRAZIL
M. A. Abdu, J. A. Bittencourt, and E. R. dePaula Mar. 1984 10 p refs Presented at the Intern. Symp. on Equatorial Aeronomy (ISEA), Mar. 1984
(INPE-3038-PRE/469) Avail: NTIS HC A02/MF A01

Ionospheric total electron content (TEC) measurements carried out by VHF electronic polarimeters over Brazilian tropical locations, namely Sao Jose dos Campos and Natal are analyzed together with other ionospheric parameters obtained from ionosondes namely f(sub o) F(sub 2) and h (sub p) F(sub 2) operated over for taleza and cachoeira paulista to determine changes in these parameters during magnetically distributed periods from 1979 to 1983. An important feature of the nighttime TEC variations is the regular occurrence of a pronounced pre-midnight enhancement over low latitude location and a past midnight-morning enhancement near the equator, during mainly the equinoctial months. Magnetic storm effects on the night TEC enhancements and on the other F region parameters, namely f(sub o) F(sub 2) and h (sub p) F (sub 2) are analyzed and discussed for four moderate to severe magnetic storm events. Author

N84-31840# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VARIABILITY IN THE HEIGHT DISTRIBUTION OF ELECTROJET CURRENTS OF JICAMARCA
P. Muralikrishna Jul. 1984 18 p refs Presented at the 36th Ann. Meeting of the SBPC (Sociedade Brasileira para o Progresso da Ciencia), Sao Paulo, Brazil, 4-11 Jul. 1984 Sponsored in part by the Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3205-PRE/563) Avail: NTIS HC A02/MF A01

Daytime variation in the average east-west drift velocity of electrons in the height range of 95-110km over Jicamarca (0.9 N, dip latitude), Peru, estimated from VHF radar measurements, is compared with variation in the horizontal component of the geomagnetic field observed at Huancayo (0.6 N, dip latitude). On magnetically quiet days, the ratio of Delta H to the electron drift velocity shows a time variation asymmetric with respect to the local noon, though one expects a symmetric cos x type of variation for the same, where x is the solar zenith angle. While Delta H is a measure of the height integrated currents over Huancayo, the drift velocity of electrons is its average in the limited height range of 95-110km over Jicamarca. Since Huancayo and Jicamarca are sufficiently close by stations, and one does not expect any considerable difference between the electrojet currents over these two stations. The present results are indicative of a time variability in the height distribution of the electrojet currents. The integrated

currents above the altitude of 110km seem to be more during the forenoon hours than during the afternoon hours, especially during the winter and equinoctal months. This asymmetry is practically absent during the summer months. The large day to day and seasonal variability of this phenomenon are discussed here in the light of an F-region current dynamo. R.J.F.

N84-31841# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
THE LITHOSPHERE PROGRAMME
E. V. Artjuskov 1983 16 p Transl. into ENGLISH from Priroda (USSR), 1982 p 9-17
(CSIR-Trans-1724) Avail: NTIS HC A02/MF A01

The focus of the International Lithosphere Program is discussed. Certain aspects of the Earth's development during the Archaeozoic and Proterozoic Eras are addressed. The evolutionary development of the lithosphere is also considered. R.S.F.

N84-31842# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
MICROTOPOGRAPHY OF MICRO-DIAMONDS FROM SEDIMENTARY COVERS IN THE SOUTHWESTERN PART OF THE EASTERN EUROPEAN PLATFORM AND A POSSIBLE GENETIC INTERPRETATION
S. I. Ribako 1983 6 p refs Transl. into ENGLISH from Dopovidi AN Ukr. RSR, Ser. B. Geol. (USSR), v. 5, 1982 p 27-30
(CSIR-Trans-1726) Avail: NTIS HC A02/MF A01

The morphology and the properties of the microdiamonds of the sedimentary cover in the Ukraine as well as in other regions of the USSR are described. The genesis of these diamonds is explained on the basis of their morphology, color, and type of defects. Microcrystals of diamonds having the morphological properties, coloring and dimensions which are used to classify the Dniester type are also present in the kimberlites of Jakutia. A characteristic feature of the microtopography of the exotic micro diamonds appears to be polycenric growth, which is detected with the aid of the electron microscope. M.A.C.

N84-31843# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON BETWEEN DENSITY PROFILES OBTAINED AT CACHOEIRA PAULISTA, BRAZIL, AND DEDUCED FROM IRI-79 MODEL
E. R. dePaula, I. J. Kantor, A. C. R. deSouza, and S. L. G. Dutra Jun. 1984 10 p refs Presented at the Solar Terrest. Predictions workshop, Meudon, France, 18-22 Jun. 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Ceintifico e Tecnologico (INPE-3136-PRE/527) Avail: NTIS HC A02/MF A01

Average profiles of electron density from the International Reference Ionosphere model, and from ionograms of Cachoeira Paulista (23 deg S, 45 deg W) were compared for the Months of March, June, September and December, 1978, for 00 and 14 hours, local time. Very good agreement was observed between the predicted and the observed profiles for all the analyzed months and hours, except in the lower heights of the profiles and in certain height intervals. Author

N84-31844# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TEMPERATURE OSCILLATIONS AND OZONE CORRELATIONS IN THE LOWER STRATOSPHERE OF NATAL (6 DEG S)
V. W. J. H. Kirchhoff, A. G. Motta, and J. R. Alves May 1984 15 p refs Presented at the 36th Ann. Meeting of the SBPC, Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3116-PRE/512) Avail: NTIS HC A02/MF A01

Temperature oscillations at Natal are investigated in order to infer correlated ozone variations. Two independent data bases are used. One refers to daily radiosonde temperature data to determine the temperature oscillations in the lower stratosphere, and another one obtained by using ECC ozonesondes to determine the correlation characteristics between temperature and ozone. Temperature excursions of up to 4 C can be ascribed to oscillations of the QBO type, with periods of 30.1 months, and the correlation analysis shows that the corresponding ozone oscillation can be of the order of 4 to 6%. Author

N84-31845# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF INFRARED IMAGERY IN THE STUDY OF FAULT ZONES
Roberto Pereira daCunha Jun. 1984 22 p refs Submitted for publication
(INPE-3143-PRE/529) Avail: NTIS HC A02/MF A01

Photoidentification and photointerpretation of faults are investigated through the use of near infrared imagery. This is demonstrated combining the knowledge of spectral response of certain mineral (e.g., iron bearing minerals) with the knowledge of geologic process. Mechanical and chemical modifications during faulting lead to differentiated endurance and composition of host rocks. These modifications, which occur along fault zones, are more readily identified in the near infrared portion of the photographic spectrum. M.A.C.

N84-31846# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE ZONALLY AVERAGED TEMPERATURE IN THE SOUTHERN HEMISPHERE
Prakki Satyamurty and Vadlamudi Brahmananda Rao Jun. 1984 15 p refs Submitted for publication
(INPE-3139-PRE/528) Avail: NTIS HC A02/MF A01

A comparison of the observed and critical temperature gradients in the Southern Hemisphere is presented. The observed meridional temperature gradients in the middle and high latitudes of the Southern Hemisphere are much higher than the critical gradients necessary for the manifestation of baroclinic instability in a two level quasi geostrophic model. This is in contrast to the baroclinic adjustment observed in the Northern Hemisphere by Stone (1978). M.A.C.

N84-31847*# Systems and Applied Sciences Corp., Hampton, Va.
EMPIRICAL STUDIES OF UPPER ATMOSPHERIC SPECIES Final Report, 23 Jul. 1982 - 7 May 1984
John Nicholson, Mike Pitts, and Dave Young 10 Jul. 1984 39 p (Contract NAS1-17089)
(NASA-CR-172437; NAS 1.26:172437) Avail: NTIS HC A03/MF A01 CSCL 04A

The first month of spin-scan ozone imaging (SOI) data (October 1981) was processed and compared with total ozone mapping spectrometer and ground based data. Short term variations in the ozone field have been revealed using animated sequences of SOI data. High correlations were observed between SOI ozone and upper tropospheric meteorological data. The relationship between ozone and temperature in the stratosphere was investigated by examining Nimbus 4 backscattered ultraviolet ozone and selective chopper radiometer temperature measurements as well as solar Nimbus 7 solar backscattered ultraviolet ozone and stratospheric and mesospheric sounder temperature measurements. Results from these ozone temperature studies were compared with calculations from theoretical 2-D models. All of the lims infrared monitor of the stratosphere data was processed at 10 pressure levels and correlations between various species have been performed. The Venus Atmospheric Drag model was modified taking into account recent investigations on the Venus thermosphere and the resulting model was considered for incorporation into the Venus International Reference Atmosphere. Author

N84-31848# Manchester Univ. (England). Dept. of Physics.
A LABORATORY STUDY OF AIRCRAFT PRECIPITATION STATIC CHARGING Final Scientific Report, 1 Aug. 1982 - 31 Jul. 1983
A. J. Illingworth May 1984 50 p
(Grant AF-AFOSR-0323-82)
(AD-A142561; AFOSR-84-0540TR) Avail: NTIS HC A03/MF A01 CSCL 04/1

Laboratory experiments show that when small ice particles

collide with targets at speeds of up to 80m/s then the charge transfer is dependent upon the work function of the target material. Most common materials charge negatively, in agreement with observed aircraft charging in ice clouds, but magnesium which has a low work function charges positively. These results enable the charging of materials to be predicted before flight, and also suggest that alloys of magnesium should minimize aircraft charging. The laboratory apparatus could be used to characterize the charging of the new composite materials for aircraft surfaces. GRA

N84-31849# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.
FINITE-AMPLITUDE INTERFACIAL WAVES Interim Report
P. G. Saffman Jul. 1984 16 p
(Contract N00014-79-C-0412)
(AD-A142767; Rept-129) Avail: NTIS HC A02/MF A01 CSCL 20/4

Properties of gravity waves at the interface between two unbounded fluids of different densities in relative motion are examined. The conditions which limit the existence of steady waves are determined. Author (GRA)

N84-31850# Global Marine Development, Inc., Irvine, Calif.
MARINE SEISMIC SYSTEM (MSS) DEPLOYMENT. PHASE 5: AN INVESTIGATION OF TECHNIQUES AND DEPLOYMENT SCENARIOS FOR INSTALLATION OF TRIAXIAL SEISMOMETER IN A BOREHOLE IN THE DEEP OCEAN Final Report, 12 Dec. 1982 - 30 Mar. 1984
R. L. Wallerstedt 31 Mar. 1984 143 p
(Contract N00014-83-C-0034; ARPA Order 4152)
(AD-A142873; MSSA04-SYS-R001) Avail: NTIS HC A07/MF A01 CSCL 17/10

During the period 1979-1983, the Defense Advanced Research Projects Agency (DARPA) sponsored the Marine Seismic System (MSS) program that successfully accomplished two deepwater seismometer installations (MSS'81 Mid-Atlantic and MSS'83 South Pacific Sites) within specially emplaced seabed reentry boreholes. These deployments were accomplished by utilizing the Deep Sea Drilling Project's (DSDP) drillship, Glomar Challenger. Each of the three MSS operations contributed data, equipment refinement, and operational insight into the overall deep ocean deployment technology. Based upon this experience, large seismometers or other delicate instruments can be confidently deployed, utilizing the drillstring reentry technique, into seabed sediment or basalt formations in water depths to 6,096 m (20,000 ft). This report describes the design features, background analyses, and operational approach associated with the MSS Deployment System. All three MSS operations are reviewed but with particular emphasis on the latest MSS'83 South Pacific deployment and recovery activities. Important development problems and/or design uncertainties are also discussed. A list of references is provided as well as a detailed listing of all applicable reports and drawings. GRA

N84-31851# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
DEEP-TOWED ARRAY GEOPHYSICAL SYSTEM (DTAGS): A HARDWARE DESCRIPTION
M. C. Fagot and S. E. Spychalski Apr. 1984 33 p
(AD-A142970; NORDA-71) Avail: NTIS HC A03/MF A01 CSCL 17/1

The development of a unique Deep-Towed Array Geophysical System (DTAGS) is nearing completion at NORDA. Newly developed hardware for the system includes: a low frequency sound source; a multichannel hydrophone array; a high data rate digital telemetry system; a microprocessor-controlled, dual tape transport, digital data record system; a real-time engineering sensor display system; a short baseline navigation system; deployment/retrieval tow vehicle handling system; and portable instrumentation vans. The system is towed near the bottom (altitude of 100 m) in the deep ocean (design depth 6000 m) and provides the capability to determine detailed geophysical character of the sea floor and upper subbottom structure (acoustic penetration depth of 500 m). This publication describes the characteristics of the major DTAGS hardware suite and reviews a field engineering test during which the system was operated at a depth of 4500 m. A list of system specifications is included. GRA

N84-31852# Nevada Univ., Reno. Div. of Earth Sciences.
GEOCHEMISTRY, AGE AND STRONTIUM COMPOSITION OF LATE TERTIARY AND QUATERNARY BASALTS AND ANDESITES IN WESTERN NEVADA AND THEIR RELATION TO GEOTHERMAL POTENTIAL Final Report, 1 Oct. 1982 - 31 Dec. 1983
Jan. 1984 182 p refs
(Contract DE-FC03-80RA-50075)
(DE84-012404; DOE/RA-50075/1) Avail: NTIS HC A09/MF A01

This research was undertaken to characterize the late Cenozoic volcanic rocks associated with active geothermal systems in west-central Nevada. Petrographic and microprobe, geochemical and isotopic analysis and age dating techniques were used to characterize these young volcanic rocks. These data were combined with the limited data previously reported in the literature on these same volcanic areas to interpret their petrogenesis. The overall characterization resulted from integrating the petrogenesis with a structural-tectonic model of the region. Potassium-argon isotopic ages ranging up to 14 million years were determined for eight localities within the Reno 1 x 2(0) study region. These ages are consistent with the morphology of the volcanic landforms, the active geothermal systems associated with them, and with other isotopic ages reported in the literature for these and similar rocks within the study region. Petrographic analysis of hand specimens and thin-sections indicated mineralogic assemblages of the respective rock types and specific mineral textures and phenocryst compositions and characteristics. These identifications were further substantiated by microprobe analysis of selected phenocrysts and groundmass phases. DOE

N84-31853# Utah Univ., Salt Lake City. Earth Science Lab.
RESULTS OF A DETAILED GRAVITY SURVEY IN THE ALAMOSA AREA, ALAMOSA COUNTY, COLORADO
Claron E. Mackelprang Sep. 1983 37 p refs
(Contract DE-AC07-79ID-12079)
(DE84-012188; DOE/ID-12079/109; ESL-126) Avail: NTIS HC A03/MF A01

A total of 322 stations, centered on the City of Alamosa, were surveyed with a gravimeter. These data show the Alamosa horst to have an irregular top. This irregularity is thought to be caused by paleovalleys and/or down-dropped fault blocks within the Precambrian horst. The City of Alamosa lies directly over a local gravity low. Volcanic rocks within this low may contain a reservoir for geothermal fluids, as yet unsubstantiated by drilling. Thermal fluids are thought to enter the Alamosa area via aquifers from the west (San Juan Mountains) and/or from the Rio Grande Rift zone with the fluids rising along fractures within and bordering the horst. The most favorable drilling targets appear to be either near the center of the local gravity low or in the fracture zone at the edges of the inferred down-dropped fault blocks. DOE

N84-31854# Geological Survey, Menlo Park, Calif.
TEMPERATURE PROFILES FROM SALT VALLEY, UTAH
J. H. Sass, A. H. Lachenbruch, and E. P. Smith 1983 21 p refs
(DE84-900996; USGS-OFR-83-455) Avail: NTIS HC A02/MF A01

Temperature profiles were obtained in the nine drilled wells as part of a thermal study of the Salt Valley anticline, Paradox Basin, Utha. Thermal conductivities were also measured on 10 samples judged to be representative of the rocks encountered in the deepest hole. The temperature profiles and thermal conductivities are presented, together with preliminary interpretive remarks and suggestions for additional work. DOE

N84-31855# Los Alamos Scientific Lab., N. Mex.
SUPRATHERMAL IONS UPSTREAM OF THE EARTH'S BOW

SHOCK
M. F. Thomsen Apr. 1984 47 p refs Presented at Chapman Conf. on Collisionless Shock Waves in the Heliosphere, Napa Valley, Calif., 20 Feb. 1984
(Contract W-7405-eng-36)
(DE84-012625; LA-UR-84-1504; CONF-840256-4) Avail: NTIS HC A03/MF A01

Two principal mechanisms have been proposed for achieving acceleration to MeV range energies: (1) Fermi acceleration through multiple scattering off of irregularities up- and downstream of the shock; and (2) shock-drift acceleration, in which particles gain energy by drifting in the inhomogeneous magnetic field of the shock in a direction parallel to the convection electric field and the solar wind. Both of these energization mechanisms require an initial seed population of suprathermal particles. Although it has been suggested that the ordinary ion heating that occurs at the shock might provide enough hot particles for the Fermi process. The effectiveness of the shock-acceleration mechanisms is enhanced if there exists an initial suprathermal ion population created by additional shock-related processes. Such suprathermal particles are indeed observed in association with collisionless shocks, and an extensive body of observational and theoretical work has been directed toward characterizing them and understanding their origin. It is the purpose of this report to review the nature of the various populations of shock associated suprathermal ions, with particular emphasis on the ion foreshock region of the Earth's bow shock. DOE

N84-31856# Washington State Dept. of Natural Resources, Olympia. Div. of Geology and Earth Resources.
COMPLETE BOUGUER GRAVITY ANOMALY MAP, CASCADE MOUNTAINS, WASHINGTON
Z. F. Danes and W. M. Phillips 1983 28 p refs
(Contract DE-AC07-79ET-27014)
(DE84-012548; DOE/ET-27014/T13) Avail: NTIS HC A03/MF A01

A Bouguer gravity anomaly map of the Cascade Mountains is presented. The map includes a large area of South Central Washington State. Information contained in the legend includes bouguer reduction density, potsdam correction, and terrain corrections. M.A.C.

N84-31857# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
STUDIES IN ATMOSPHERIC CHEMISTRY. PART 1: PRIMARY PEROXIDES FROM HYDROCARBONS. PART 2: ELEMENTAL ANALYSIS USING NUCLEAR REACTIONS Ph.D. Thesis
P. M. McKinney Apr. 1984 77 p refs
(Contract DE-AC03-76SF-00098; Grant NSF ATM-82-10343)
(DE84-012246; LBL-17782) Avail: NTIS HC A05/MF A01

The interaction of combustion effluents with SO2 was studied in a cylindrical reactor. The apparent SO2 concentration was reduced by 60 to 90% during propane combustion but only 10% during CO, natural gas or hydrogen combustion. Peroxides were collected in a bubbler from the combustion effluent of methane, ethane, propane and butane. The peroxide concentration was greatest when the flame was interrupted. These peroxides reacted rapidly with HSO3(-) forming SO4(2-). DOE

N84-31858# Texas Univ., Austin. Bureau of Geology.
LINEAMENTS OF TEXAS: POSSIBLE SURFACE EXPRESSIONS OF DEEP-SEATED PHENOMENA Final Report
C. M. Woodruff, Jr. and S. C. Caran Apr. 1984 100 p refs
(Contract DE-AS07-79ID-12057)
(DE84-010827; DOE/ID-12057/T7) Avail: NTIS HC A05/MF A01

Lineaments were identified on 51 LANDSAT images covering Texas and parts of adjacent states in Mexico and the United States. A method of identifying lineaments was designed so that the findings would be consistent, uncomplicated, objective, and reproducible. Lineaments denoted on the LANDSAT images were traced onto 1:250,000-scale work maps and then rendered cartographically on maps representing each of the 51 LANDSAT images at a scale of 1:500,000. At this stage more than 31,000 lineaments were identified. It included significant areas outside of Texas. In preparing the final lineament map of Texas at 1:1,000,000-scale from the 1:500,000-scale maps, all features that lay outside Texas and repetition among features perceived by individual workers were eliminated. Cultural features were checked for before reducing and cartographically fitting the mosaic of 51 individual map sheets to a single map base. Lineaments that were partly colinear but with different end points were modified into a single lineament trace with the combined length of the two or more colinear lineaments. DOE

N84-31859# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
THE PROJECT STRAFAM: TEST OF A NEW PARACHUTE BASED INSTRUMENT CARRIER FOR STRATOSPHERIC RESEARCH Final Report, Feb. 1982
Klaus Pfeilsticker, Werner Thron, Dieter Doerflinger, Frank Arnold, Werner Gabriel (DFVLR, Oberpfaffenhofen, West Germany), and Helmut Lang (Helatronik G.m.g.H.) Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-021; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

The project STRAFAM, a parachute-borne dropsonde for in situ ion composition measurements in the upper stratosphere is described. The scientific aims of the project, the technical design of the dropsonde, and the details of the test flight are outlined. The first test flight is successful. Author (ESA)

N84-31860# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DIRECT GENERATION OF SEISMIC FLOOR RESPONSE SPECTRA FOR CLASSICALLY AND NONCLASSICALLY DAMPED STRUCTURES Final Report
A. M. Sharma Nov. 1983 324 p refs
(Grant NSF CEE-81-09100)
(PB84-191675; VPI-83-44) Avail: NTIS HC A14/MF A01 CSCL 08K

Floor response spectra are commonly used as seismic inputs for the design of secondary systems. Several direct approaches based on the method of mode displacement as well as mode acceleration were developed for generation of floor spectra for classically and non-classically damped systems. The mode displacement approaches require pseudo acceleration and relative velocity spectra whereas the mode acceleration approaches require relative acceleration and velocity spectra as their seismic inputs. These proposed approaches were validated by a comprehensive numerical simulation study involving several ensembles of time histories. For structural systems with dominant high frequency modes, the mode displacement approaches may give inaccurate results if only a first few modes are used in the analysis, wheeas the mode acceleration approaches will still predict the resonse accurately. The mode acceleration approaches are proposed as better alternatives to the currently used mode displacement approaches. GRA

N84-31861# National Geodetic Survey, Rockville, Md.
STATISTICAL TESTS FOR DETECTING CRUSTAL MOVEMENTS USING BAYESIAN INFERENCE
K. R. Koch 1984 12 p refs
(PB84-198811; NOAA-TR-NOS-NGS-29; NOAA-84060405) Avail: NTIS HC A02/MF A01 CSCL 08K

The test of a general linear hypothesis in sampling theory, applied to the detection of recent crustal movements, is compared with Bayesian inference based on vague prior distributions. Both approaches give equivalent results. In addition, the test of inequality constraints can be readily derived by Bayesian inference. Also, less sensitive and more realistic tests than the ones of the sampling theory of the detection of crustal movements are obtained by Bayesian inference. These tests are simple to apply, as the

distribution needed is the central F-distribution. As an example, two epochs of leveling data are analyzed in the Houston-Galveston, Tex., region, an area of marked land subsidence.
Author (GRA)

N84-31862# National Academy of Sciences - National Research Council, Washington, D. C. Panel on Seismological Studies of the Continental Lithosphere.
SEISMOLOGICAL STUDIES OF THE CONTINENTAL LITHOSPHERE Final Report
Apr. 1984 157 p refs
(Contract DI-14-08-0001-G-824)
(PB84-194752) Avail: NTIS HC A08/MF A01 CSCL 08G

A number of major geological problems of the continental lithosphere are identified and discussed. An integrated seismological approach is suggested for attacking them. It is concluded, however, that current seismological instrumentation is deficient in quality and quantity for the task. Specifications for new instrumentation are given. Recommendations are directed toward a national effort for seismic exploration of the continental crust. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-31863*# Science Applications, Inc., McLean, Va.
THREE-DIMENSIONAL COMPUTER MODEL FOR THE ATMOSPHERIC GENERAL CIRCULATION EXPERIMENT Final Report
Glyn O. Roberts Jun. 1984 38 p refs
(Contract NAS8-34751)
(NASA-CR-171109; NAS 1.26:171109; SAI-84/1142) Avail: NTIS HC A03/MF A01 CSCL 04B

An efficient, flexible, three-dimensional, hydrodynamic, computer code has been developed for a spherical cap geometry. The code will be used to simulate NASA's Atmospheric General Circulation Experiment (AGCE). The AGCE is a spherical, baroclinic experiment which will model the large-scale dynamics of our atmosphere; it has been proposed to NASA for future Spacelab flights. In the AGCE a radial dielectric body force will simulate gravity, with hot fluid tending to move outwards. In order that this force be dominant, the AGCE must be operated in a low gravity environment such as Spacelab. The full potential of the AGCE will only be realized by working in conjunction with an accurate computer model. Proposed experimental parameter settings will be checked first using model runs. Then actual experimental results will be compared with the model predictions. This interaction between experiment and theory will be very valuable in determining the nature of the AGCE flows and hence their relationship to analytical theories and actual atmospheric dynamics. B.W.

N84-31864# Meteorological Satellite Center, Tokyo (Japan).
INTRODUCTION TO METEOROLOGICAL SATELLITE CENTER OF JAPAN METEOROLOGICAL AGENCY
Mar. 1984 38 p Original contains color illustrations
Avail: NTIS HC A03/MF A01

The activities of the Japan Meteorological Agency's Meteorological Satellite Center (MSC) are described. An outline of the Geostationary Meteorological Satellite System (GMSS) mission is provided as well as information on data processing products of the MSC, the receiving system for meteorological telecommunications, and the signal and image characteristics of meteorological data. M.A.C.

N84-31865*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CLIMATOLOGY OF OZONE AT ALTITUDES FROM 19,000 AT 59,000 FEET BASED ON COMBINED GASP AND OZONESONDE DATA
William H. Jasperson (Control Data Corp.), Gregory D. Nastrom (Control Data Corp.), and James D. Holdeman Aug. 1984 363 p refs
(Contract DOT-FA78WAI-893)
(NASA-TP-2303; E-1626; NAS 1.60:2303) Avail: NTIS HC A16/MF A01 CSCL 04B

A climatology of ozone for altitudes from FL190 to FL590 (19,000 to 59,000 ft) is presented. Climatological tables are given in two appendixes: one with d deg latitude resolution on a monthly basis, and one with 10 deg latitude resolution on a seasonal basis. Data were taken from 11,472 balloon-borne ozonesondes launched at 60 stations from 1963 to 1980 and from over 160,000 observations made by the Global Atmospheric Sampling Program on 4417 commercial airliner flights from 1975 to 1979. Case study and statistical comparisons of results from these two data sets showed that they are compatible and can be combined. Several examples of analyses that can be made by using the tabulated data are given and discussed. Author

N84-31866*# Wisconsin Univ., Madison.
APPLICATIONS OF THE AVE-SESAME DATA SETS TO MESOSCALE STUDIES Final Report
David Suchman, Brian Auvine, H. Michael Goodman, Raymond Lord, and David Santek Washington NASA Aug. 1984 88 p refs
(Contract NAS8-33799)
(NASA-CR-3819; NAS 1.26:3819) Avail: NTIS HC A05/MF A01 CSCL 04B

Two severe weather days during the 1979 severe environmental storms and mesoscale experiment (SESAME) period, May 2 and 20, are studied using a variety of data from GOES rapid-scan imagery along with radar, rawinsondes, and surface severe weather reports. These data sources are used to produce radar plots, combined satellite tracer and raob wind sets, visible brightness and IR temperature contour plots, and histograms of satellite brightness versus area. Documentation for data processing and analysis software is included. The timing and location of the severe weather outbreaks on May 2 are related to these data products with the following results: the environment of the outbreak is shown to be favorable to severe weather using low and high level divergence, low level moisture convergence, and isentropic analysis. The areas enclosed by various infrared temperature contours in the immediate vicinity of severe weather were plotted over time to show a tendency for tornadoes to occur during areal expansion. Dissipation of a tornado is associated with declining areal coverage of these contours as well as an increasing distance of the tornado away from the brightest visible cloud tops and the infrared gradient region. R.S.F.

N84-31867# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TELECONNECTIONS AND SEA SURFACE TEMPERATURE ANOMALY EFFECTS ON THE DROUGHT OF 1983 IN NORTHEAST BRAZIL
Prakki Satyamurty and V. Brahmananda Rao Aug. 1984 7 p refs Presented at the 2nd WMO Symp. on Tropical Droughts, Fortaleza, Brazil, Sep. 1984
(INPE-3214-PRE/567) Avail: NTIS HC A02/MF A01

The year 1983 was an year of extreme drought in the Northeast Brazil (NEB). The 1983 precipitation in NEB in its rainy season was observed to be only 40% of the normal by Rao and De Brito (1984). The Newfoundland monthly mean surface pressure anomalies showed values ranging from +2 to +4 mb during the period October 1982 April 1983. These support the teleconnections between the NEB precipitation and the low level cyclonic activity in the region of Newfoundland proposed by Namias (1972). The difference between sea surface temperature anomalies north of the equator and south of the equator in the Atlantic is considered as an index to verify the effect of north-south Hadley circulation on the NEB drought as proposed by Moura and Shukla (1981). During the months of December January and February the anomaly is less than 1 C and during March, April, and May it is even slightly negative. This shows the drought of 1983 was not due to the changes in the north-south circulations and suggests the relative importance of anomalous east-west Walker circulations, as caused by El Nino, for example. R.J.F.

N84-31868# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTERANNUAL VARIATIONS OF RAINFALL IN NORTHEAST BRAZIL AND THEIR CONNECTIONS WITH THE LARGE-SCALE FEATURES
V. Brahmananda Rao and Jose Ivaldo B. deBrito Jul. 1984 6 p refs Presented at the 2nd WMO Symp. on Tropical Droughts, Fortaleza, Brazil, Sep. 1984
(INPE-3207-PRE/565) Avail: NTIS HC A02/MF A01

Rainfall data of northeast Brazil for the last 23 years (1961-1983) are examined. It is found that the drought of 1983 was extensive. In the interior, dry region rainfall during the rainy season of 1983 was only 40% of the normal. The drought of this year was the worst in the past two decades. Rainfall anomalies of northeast Brazil are related to two large-scale features: winter circulation of the Northern Hemisphere and the Southern Oscillation. Grid point values of 700 mb height of the Northern Hemisphere during winter are correlated with the rainfall of northeast Brazil. Isolines of correlation coefficient showed distinct centers of positive and negative correlations. A positive center is found over Siberia during the winter months. In the February geopotential height vs. March rainfall iso-correlation map a strong negative center (significant at 99% level) is found over northeast United States. This is consistent with the earlier finding of Namais (1972). Regarding the association with the Southern Oscillations, rainfall variations in northeast Brazil seem to succeed variations in the Southern Oscillation by 2 months. Author

N84-31869# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DAILY VARIATIONS OF TEMPERATURE AND HUMIDITY WITHIN AND ABOVE AMAZONIAN FOREST
W. James Shuttleworth, John H. C. Gash, Colin R. Lloyd, Christopher J. Moore, John Roberts, Ari deO. Marques, Filho, Gilberto Fisch, Vicente dePaula Silva, Filho, Maria deNazare Goes Ribeiro et al Jul. 1984 17 p refs Submitted for publication
(INPE-3196-PRE/560) Avail: NTIS HC A02/MF A01

The behavior of profiles of humidity and temperature above and within the canopy of Amazonian forest in dry and wet conditions is demonstrated; qualitative insight into some of the processes involved in energy exchange from this type of vegetation is allowed. In dry daylight conditions the temperature, humidity and humidity deficit of the top two thirds of the canopy are similar to those of the atmosphere above, but air at the base of the canopy is strongly decoupled. At night the behavior is reversed, and air in the lower two thirds of the canopy is partly decoupled from that a higher levels. The response to convective storms is rapid but fairly short lived, and local energy advection can occur during and after rainfall. Author

N84-31870# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
OBSERVATIONS OF RADIATION EXCHANGE ABOVE AND BELOW AMAZONIAN FOREST
W. James Shuttleworth (Inst. of Hydrology, Wallingford, England), John H. C. Gash (Inst. of Hydrology, Wallingford, England), Colin R. Lloyd (Inst. of Hydrology, Wallingford, England), Christopher J. Moore (Inst. of Hydrology, Wallingford, England), John Roberts (Inst. of Hydrology, Wallingford, England), Ari deO. Marques Filho (Inst. Nacional de Pesquisas da Amazonia, Manaus Amazonas, Brazil), Gilberto Fisch (Inst. Nacional de Pesquisas da Amazonia, Manaus Amazonas, Brazil), Vicente dePaula S. Filho (Inst. Nacional de Pesquisas da Amazonia, Manaus Amazonas, Brazil), Maria deNazare Goes Ribeiro (Inst. Nacional de Pesquisas da Amazonia, Manaus Amazonas, Brazil), and Luis Carlos B. Molion Jul. 1984 21 p refs Submitted for publication
(INPE-3194-PRE/558) Avail: NTIS HC A02/MF A01

Measurements of short and long wave components of the radiation budget were made above and below the tropical forest in the Amazon Basin for a total of 203 hours. Albedo was 12.25 + or - 0.2 per cent. The net outward flux of longwave radiation was aproximately 30W/sq m, and fairly constant over the day. The relationship between net radiation, R, and solar radiation, S, is adequately described by the expression R = (0.858 + or - 0.006)S - (35.0 + or 1.9) W/sq m. The fraction of solar radiation reaching the bottom of the canopy was low, 1.15 per cent; net radiation in this position is consistent with low soil heat flux and low soil evaporation. Author

N84-31871# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
MODEL CLOUD RELATIONSHIPS Final Report, 26 Nov. 1981 - 30 Sep. 1983
W. R. Cotton, E. E. Hindman, G. Tripoli, R. L. McAnelly, and C. Chen 30 Oct. 1983 154 p
(Contract F19628-82-K-0003)
(AD-A142690; AFGL-TR-84-0028) Avail: NTIS HC A08/MF A01 CSCL 04/2

The factors contributing to the variability of radar reflectivity - water content relationships are investigated using a combination of numerical simulations using the 3-D cloud/mesoscale model and field measurements. It was found that model predictions of reflectivities due to ice crystals are inaccurate due to a lack of information on predicting the concentrations of ice crystals in cloud. In contrast, it was found that model-predicted PPI and RHI reflectivities compared favorably to measured reflectivities for Florida cumulus. Raindrops and graupel particles caused the measured reflectivities; ice crystals contributed negligibly. The model-predicted reflectivities were deemed sufficiently accurate, from the Florida comparison, to investigate the causes for the variability in water content-radar reflectivity relationships. GRA

N84-31872# Air Force Geophysics Lab., Hanscom AFB, Mass. Cloud Physics Branch.
AFGL CLOUD MODELING PROGRAM: ANNEX
R. M. Banta 26 Jun. 1984 5 p Presented at the Intern. Cloud Modeling Workshop-Conf., Aspen, Colo., 3-6 Oct. 1983
(AF Proj. 6670)
(AD-A143084; AFGL-TR-84-0155) Avail: NTIS HC A02/MF A01 CSCL 04/2

A newly established cloud modeling program in the Cloud Physics Branch of the Air Force Geophysics Laboratory will employ a three-dimensional cloud model to predict cloud dynamic and bulk-microphysical quantities and a 1 1/2-dimensional Eulerian cloud model to determine more detailed microphysical properties of clouds. These modeling studies will be applied to problems involving electromagnetic propagation in cloud and airframe icing. Four approaches for determining detailed microphysical properties of clouds from a 3-D bulk microphysical model are outlined in order of increasing complexity. GRA

N84-31873# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
LARGE-SCALE ATMOSPHERE-OCEAN COUPLING Final Technical Report, May 1980 - Apr. 1983
C. P. Chang and K. M. Lau May 1984 101 p
(Grant NSF ATM-79-24010)
(AD-A143162; NPS63-84-004) Avail: NTIS HC A06/MF A01 CSCL 04/2

Large-scale coupling between the tropical atmosphere and ocean in relation to the El Nino/Southern Oscillation (ENSO) phenomenon is studied using both observational and theoretical/modeling approaches. Utilizing satellite observations, a connection has been successfully identified between Pacific tropical diabatic heating anomalies and extratropical circulation system over the North Pacific from East Asia to the continental North America. This teleconnection is strongly correlated with tropical Pacific sea surface temperature anomalies during ENSO. Shorter period fluctuation (40-50 day period) in the atmosphere also shows some signature of the above teleconnection pattern suggesting the presence of a multi-equilibrium climate state realizable both in the intraseasonal and interannual time scale. The above observations have led to the development of a stochastic-dynamical theory of ENSO, now being pursed by one of the Co-PI's (KML). Based on the results of an earlier theoretical investigation showing the presence of unstable coupled air-sea interaction in the tropics, a coupled atmosphere-ocean model has been developed. Various

versions of this model and parameterization of air-sea coupling have been tested, and experiments performed. B.W.

N84-31874# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
HUMIDITY/CLOUD-RADIATION FEEDBACK ON POSSIBLE CLIMATIC PERTURBATION DUE TO FOSSIL FUEL UTILIZATION Technical Progress Report, Sep. 1983 - Mar. 1984
Wei-Chyung Wang Apr. 1984 4 p
(Contract DE-AC02-81ER-60023)
(DE84-011895; DOE/ER-60023/T1) Avail: NTIS HC A02/MF A01

Research progress is reported on studies at the contribution of atmospheric N2O, CH4, and CFCs to the Earth's clear sky infrared radiation budget, the incorporation of the cumulus convection scheme into the 1-D tropical model, the cloud altitude feedback effect, and an ongoing radiation models intercomparison program. DOE

N84-31875# Pacific Northwest Lab., Richland, Wash.
MEASUREMENT OF TURBULENT WIND VELOCITIES USING A ROTATING BOOM APPARATUS
V. A. Sanborn and J. R. Connell Apr. 1984 76 p refs Prepared in cooperation with Colorado State Univ., Fort Collins
(Contract DE-AC06-76RL-01830)
(DE84-012417; PNL-4888) Avail: NTIS HC A05/MF A01

The present report covers both the development of a rotating-boom facility and the evaluation of the spectral energy of the turbulence measured relative to the rotating boom. The rotating boom is composed of a helicopter blade driven through a pulley speed reducer by a variable speed motor. The boom is mounted on a semiportable tower that can be raised to provide various ratios of hub height to rotor diameter. The boom can be mounted to rotate in either the vertical or horizontal plane. Probes that measure the three components of turbulence can be mounted at any location along the radius of the boom. Special hot-film sensors measured two components of the turbulence at a point directly in front of the rotating blade. By using the probe rotated 90 deg about its axis, the third turbulent velocity component was measured. Evaluation of the special energy distributions for the three components of velocity indicates a large concentration of energy at the rotational frequency. At frequencies slightly below the rotational frequency, the spectral energy is greatly reduced over that measured for the nonrotating case measurements. Peaks in the energy at frequencies that are multiples of the rotation frequency were also observed. DOE

N84-31876# Oregon State Univ., Corvallis. Dept. of Atmospheric Science.
REGIONAL WIND ENERGY ASSESSMENT PROGRAM REPORT. APPENDIX: WIND STATISTICS SUMMARIES Progress Report, Oct. 1982 - Sep. 1983
R. W. Baker and J. E. Wade Feb. 1984 94 p refs Sponsored by Bonneville Power Administration
(DE84-011835; DOE/BP-212-App; BPA-83-12-App) Avail: NTIS HC A05/MF A01

This report is made up of tables which show the Wind Speed Frequency Distribution Summaries of twenty-six different sites. DOE

N84-31877# Pacific Northwest Lab., Richland, Wash.
US ANNUAL AVERAGE WIND POWER
1984 15 p
(Contract DE-AC06-76RL-01830)
(DE84-012215; DOE/EL-01830/T18) Avail: NTIS HC A02/MF A01

This wind resource map, produced by Pacific Northwest Laboratory for the US Department of Energy, is based on a synthesis of 12 regional assessments covering the United States and its territories. For each region, wind resource assessments are presented in the form of an atlas. The atlases depict in graphic, tabular and narrative form the wind resource on a regional and state level. Local terrain features may interact with the windfield to cause the wind power to vary as much as + or - 50% to 100% from the assessment value. Thus, there may be local areas of high wind power in regions estimated to have low wind power; conversely, some local areas may have lower wind power than that shown by this assessment. Maps depicting the degree of certainty of these assessment values are also available and should be used in combination with this wind resource map. DOE

N84-31878# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
REGIONAL WIND ENERGY ASSESSMENT PROGRAM Progress Report, Oct. 1982 - Sep. 1983
Robert W. Baker and John E. Wade Feb. 1984 115 p refs Sponsored by Bonneville Power Admin., Portland, Oreg.
(DE84-011832; DOE/BP-211; BPA-83-12) Avail: NTIS HC A06/MF A01

The Bonneville Power Administration's (BPA) planning function requires that estimates be made of the magnitude, cost, and availability of all energy resources which may be available over a 20-year planning horizon. In order to assess the quantity, quality and location of wind energy resources in the Pacific Northwest, BPA commenced in 1980 a five year Regional Wind Energy Assessment Program through a contracting with the Oregon State University Wind Resource Assessment Laboratory. The program centers on wind prospecting, site instrumentation, data collection and analysis, and area verification in the BPA service area. The area covered in the study is extensive (over 250,000 sq mi.) as it includes Washington, Oregon, Idaho, western Montana, and portions of nothern Neveda and northern California. The topography is often complex and rugged and the wind characteristics (persistence and strength) can change dramatically in a short distance. Because of the spatial variability of the wind throughout the BPA service area, effort has been directed at instrumenting and analyzing data at sites throughout the service area. Over the past several years a large number of sites have been selected, instrumented and the data analyzed. DOE

N84-31879# Oak Ridge National Lab., Tenn.
ATMOSPHERIC RETENTION OF ANTHROGENIC CO2: SCENARIO DEPENDENCE OF THE AIRBORNE FRACTION Final Report
A. M. Perry May 1984 63 p refs Sponsored in part by Electric Power Research Institute
(Contract DE-AC05-84OR-21400)
(DE84-012079; EPRI-EA-3466) Avail: NTIS HC A04/MF A01

Carbon dioxide (CO2) production from human activities, notably fossil fuel combustion, contributes to future increases in the CO2 concentration in the Earth's atmosphere. The fraction off cumulative future CO2 production that remains in the atmosphere, as a function of time, was calculated for 19 hypothetical scenarios for worldwide CO2 production, using two quite different models of the global carbon cycle. Over a wide range of assumed values for total cumulative CO2 production and for initial (post-1980) rates of growth of annual CO2 production, the airborne fractions for the various scenarios correlate well with the maximum annual CO2 production rate attained in each scenario. For scenarios in which the peak CO2 production rate is 10 to 20 times the present rate, the airborne fraction possibly exceeds 0.8; for scenarios with peak production rates 2 to 3 times the present rate, the airborne fraction is estimated to be around 0.6. Present carbon cycle models may not correctly estimate the distribution of CO2 among the major global carbon reservoirs, but the upward trend in airborne fraction with increasing annual carbon release rate is plausible and probably real. DOE

N84-31880# United Industries Corp., Bellevue, Wash.
AIRBORNE WIND MEASUREMENTS AT CAPE BLANCO, OREGON
Jung-Tai Lin and Scott D. Veenhuizen Dec. 1983 48 p ref
(Contract DE-AC79-82BP-34337)
(DE84-013662; DOE/BP-257; Rept-8318) Avail: NTIS HC A03/MF A01

The airborne wind measuring system using a fixed wing airplane

and a Loran-C navigation unit was proven to be feasible to provide the large scale background wind flow for initialization of numerical wind modeling. The rms errors in the airborne wind measuring system were plus or minus 2 mph in wind speed and plus or minus 12 degrees in wind direction. The advantages of this method were that wind speeds over a large area (5 miles x 14 miles, or 18 miles x 30 miles) may be determined rapidly, economically and at altitudes above the normal altitudes of kite measurements. The disadvantages were that the spatial resolution of the measurements was poor and near surface measurements were not feasible using a fixed wing aircraft. DOE

N84-31881# Oak Ridge National Lab., Tenn.
INVENTORY OF NUMERIC DATA FOR CARBON DIOXIDE RESEARCH, REVISION 1
J. A. Watts Jun. 1984 270 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013683; ORNL/CDIC-1/R1-Rev-1) Avail: NTIS HC A12/MF A01

The 1983 inventory documenting the results of a survey to determine the status and availability of numeric data for application in carbon dioxide research and modeling studies is updated. The inventory focuses on the identification, status, and accessibility of data pertinent to the carbon dioxide research programs of the US Department of Energy Carbon Dioxide Research Division. The inventory process will continue to evolve as research programs proceed and new data are collected or identified as being needed for specific efforts. Promoting contributor/user interaction is one mechanism to give direction to secondary users of the data by identifying the primary collectors, the types of data collected and availability, and how the data have been applied and/or interpreted. It serves as a guide for the Carbon Dioxide Information Center (CDIC) in the acquisition, organization, documentation, and evaluation of data to meet research needs. Descriptions of newly identified datasets and corrections to existing data descriptions will be issued periodically. DOE

N84-31882# Argonne National Lab., Ill.
CO2 FORECASTING AND CONTROL: A MATHEMATICAL APPROACH
T. A. Daly, N. Goto (Yale Univ.), R. F. Kosobud (Illinois Univ., Chicago), and W. D. Nordhaus 1984 20 p refs Presented at the 150th Natl. Meeting of the American Association for the Advancement of Science, New York, 24 May 1984
(Contract W-31-109-eng-38)
(DE84-013454; CONF-840501-1) Avail: NTIS HC A02/MF A01

Future concentrations of CO2 were estimated by means of a mathematical programming approach. Certain price-sensitive demands for energy and a number of alternative technologies for meeting those energy demand paths are specified. Least cost was assumed for meeting energy demands. DOE

N84-31883# National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Lab.
GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE NUMBER 11, Summary Report, 1982
Joyce M. Harris and Barry A. Bodhaine Dec. 1983 174 p refs
(PB84-181841; NOAA-84041801) Avail: NTIS HC A08/MF A01 CSCL 04B

The research operations and accomplishments by the Geophysical Monitoring for climatic change (GMCC) program are summarized. Operations and management at GMCC's four baseline sites, scientific data from measurement projects, conclusions from analyses of data, and basic research achievements are included. Specific research topics discussed were determining the carbon dioxide concentration in the atmosphere, monitoring ozone and water vapor in the atmosphere, and measuring solar radiation. R.S.F.

N84-31884# National Oceanic and Atmospheric Administration, Rockville, Md. Federal Coordinator for Meteorological Services and Supporting Research.
FEDERAL PLAN FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH, FISCAL YEAR 1985
Mar. 1984 148 p
(PB84-182732; FCM-P1-1984; NOAA-84041906) Avail: NTIS HC A07/MF A01 CSCL 04B

This Federal Plan is the twentieth in a series of annual plans developed by the Office of the Federal Coordinator for Meteorological Services and Supporting Research. This Plan focuses on the measures being taken to protect weather-sensitive activities. It provides a coordinated, overall plan for government meteorological services and for those research and development programs that directly support and improve meteorological services. The Plan covers the programs of all agencies for FY-84 and FY-85. Much of the FY-85 activity is aimed at strengthening the basic meteorological system through advanced weather radar, weather satellites, larger and faster computers, improved weather reconnaissance system, better forecast models of the ocean and atmosphere, and preparedness of the public to respond to warnings. GRA

N84-31885# National Center for Atmospheric Research, Boulder, Colo.
EXTENDING NORMAL MODE INITIALIZATION: A NEW METHOD Thesis
Philip John Rasch 1984 158 p refs Sponsored in part by Florida State Univ. and NSF
(PB84-196435; NCAR/CT-81) Avail: NTIS HC A08/MF A01 CSCL 04B

The nonlinear normal mode initialization procedure is extended to situations where the current methods encounter problems (convergence of iteration, and reduction of divergent circulations) the motivation behind the use of initializations is described and the normal modes of atmospheric models are reviewed. Two facets of the decomposition are advanced. Current techniques and their problems are discussed. An alternate formulation is introduced for the current normal mode initialization methods, which permits the initializations to be interpreted as filters.The normal mode initialization process is examined in a more complex setting, using a mode of comparable sophistication and complexity to a state of the art operational forecast model (the NCAR Community Climate Model-CCMOB), although run in a low resolution research mode. GRA

N84-31886# Intermountain Forest and Range Experiment Station, Ogden, Utah.
COMPUTER PROGRAMS FOR SUMMARIZING CLIMATIC DATA STORED IN THE NATIONAL FIRE WEATHER DATA LIBRARY
Larry S. Bradshaw and William C. Fischer May 1984 43 p
(PB84-197011; FSGTR/NT-164) Avail: NTIS HC A03/MF A01 CSCL 04B

Computer programs that facilitate obtaining climatological summaries of information stored in the National Fire Weather Data Library are described. Computer programs for enhancing reliability of data-deficient weather records are also described. Instructions for executing the programs are given. GRA

N84-31887# National Weather Service, Garden City, N.Y. Scientific Services Div.
A COMPUTER CALCULATION AND DISPLAY STATION FOR SLOSH HURRICANE SURGE MODEL DATA
John F. Townsend May 1984 26 p refs
(PB84-198753; NOAA-TM-NWS-ER-67; NOAA-84060106) Avail: NTIS HC A03/MF A01 CSCL 04B

The SPLASH (special program to list the amplitudes of surges from hurricanes) and SLOSH (sea, lake and overland surges from hurricanes) models used by the National Weather Sercive compute storm surge heights under hypothetical hurricane conditions. The SPLASH model is useful for modeling hurricane effects along relatively smooth coastlines, while the SLOSH models is used for irregular coastlines, especially those with major bays and estuaries. The SLOSH model, which is able to gauge flooding for inland areas, is considerably more sophisticated than the SPLASH model. These models, especially SLOSH, are increasingly used by local planners to determine evacuation routes to use during hurricane conditions. GRA

N84-31888# National Oceanic and Atmospheric Administration, Rockville, Md. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL HURRICANE OPERATIONS PLAN
May 1984 88 p
(PB84-198837; NOAA-84052404; FCM-P12-1984) Avail: NTIS HC A05/MF A01 CSCL 04B

The Hurricane Warning Service is an interdepartmental effort to provide the Nation and designated international recipients with environmental data, forecasts, and assessments concerning tropical and subtropical weather systems. Interdepartmental cooperation achieves economy and efficiency in the operation of the Hurricane Warning Service. This plan provides the basis for implementing the agreements of the Department of Commerce, Department of Defense, and the Department of Transportation, reached at the annual Interdepartmental Hurricane Conference (combined Atlantic and Pacific). Author (GRA)

N84-31889# National Oceanic and Atmospheric Administration, Washington, D. C.
INTERNATIONAL METEOROLOGICAL SATELLITE SYSTEM: ISSUES AND OPTIONS
Nov. 1983 134 p
(PB84-199603; NOAA-84060403) Avail: NTIS HC A07/MF A01 CSCL 04B

Mechanisms to ensure the long-term continuity of meteorological satellite data and to share more equitably costs of such continuity through international cooperation are examined. Four models are discussed based the International Telecommunications Satellite Organization (INTELSAT), the Coordination on Geostationary Meteorological Satellites (CGMS), the World Meteorological Organization (WMO), and the European Organization for the exploitation of Meteorological Satellites (EUMETSAT). GRA

N84-31890# National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environmental Lab.
METLIB-2: A PROGRAM LIBRARY FOR CALCULATING AND PLOTTING ATMOSPHERIC AND OCEANIC FIELDS
S. A. Macklin, R. L. Brown, J. Gray, and R. W. Lindsay Apr. 1984 59 p refs
(PB84-205434; NOAA-TM-34L-PMEL-54; NOAA-84061105) Avail: NTIS HC A04/MF A01 CSCL 04B

The METLIB-2 FORTRAN program library derives time series of geostrophic, gradient, or surface winds from sea level pressure (SLP) and ancillary fields gridded on a polar stereographic projection. The library also contains programs for contouring scalars, such as SLP, air temperature, or wind speed, and for plotting wind vectors on a map background. Plotting is based upon the National Center for Atmospheric Research graphics routines. A major advantage of the library is that spherical geometric calculations involving polar stereographic grids are internal to the programs. The relationship between geostrophic or gradient wind and surface wind can be assigned from speed reduction and turning angle constants or by a baroclinic, stability dependent, single point boundary layer model. GRA

N84-31891# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
MEASUREMENTS INSIDE OKLAHOMA THUNDERSTORMS
Andrew J. Heymsfield and Mark R. Hjelmfelt Apr. 1984 249 p refs Sponsored in part by NSF
(PB84-206911; NCAR/TN-230) Avail: NTIS HC A11/MF A01 CSCL 04B

The state parameter and hydrometeor measurements obtained with the South Dakota School of Mines and Technology (SDSMT) T-28 aircraft within Oklahoma convective clouds during the Severe Environmental Storms and Mesoscale Experiment (SESAME) field season in 1979. Completed sets of hydrometeor and state parameter data are presented for six cases which were identified as the most interesting of those sampled by the T-28 during SESAME. GRA

N84-31892# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
ENVIRONMENTAL RESEARCH LABORATORIES PUBLICATION ABSTRACTS, FY 1983
Oct. 1983 162 p
(PB84-189323; NOAA-84043013) Avail: NTIS HC A08/MF A01 CSCL 04B

The Environmental Research Laboratories (ERL) conduct fundamental investigations needed to improve understanding of the geophysical environment. Programs include investigation of ocean processes and their interactions with the atmosphere; studies of the ocean environment as it is affected by waste disposal and development of energy and food resources; fundamental studies of the upper atmosphere and space environments; lower atmosphere research on the weather and climate; research on severe local storms, hurricanes, and tsunamis; studies of cloud processes; research on the environmental effects of regional and global pollution; and development of equipment, instruments, systems, and facilities for these programs. GRA

N84-31893# National Oceanic and Atmospheric Administration, Rockville, Md.
PROCEEDINGS OF THE 8TH ANNUAL CLIMATE DIAGNOSTICS WORKSHOP
Mar. 1984 414 p refs Workshop held at Downsville, Ontario, 17-21 Oct. 1983
(PB84-192418; NOAA-84051002) Avail: NTIS HC A14/MF A01 CSCL 04B

A review of climate fluctuations for the period September 1982 to August 1983 is presented including papers on global surface air temperature variations, factors leading to heavy precipitation, and observed climatic abberations of the Western Hemisphere. El Nino-Southern Oscillation, El Chichon, and other anomalies are thoroughly discussed. Reliability of circulation statistics, energy and momentum computations, and parameterization of transient eddy effects are presented under the general topic of climate diagnostics. Monthly and seasonal predictions are discussed. E.R.

N84-31894# National Weather Service, Silver Spring, Md.
SELECTED WORLDWIDE MARINE WEATHER BROADCASTS
Jan. 1984 179 p refs Sponsored in part by Dept. of the Navy
(PB84-192855; NOAA-84051701) Avail: NTIS HC A09/MF A01 CSCL 04B

Information on and schedules of marine weather broadcasts made in the English language are presented. Part 1 contains information on weather broadcasts that is relatively stable or that does not lend itself to a time oriented format. Part 2 contains the schedules of marine weather broadcasts in 4 sections: radiotelegraph; radiotelephone; radiofacsimile; and radioteleprinter. Data on broadcasts in other languages are included only when English broadcasts are not available in the area. GRA

N84-31895# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
SURFACE WINDS IN SOME ALASKAN PASSES
Mar. 1984 23 p refs
(PB84-194745; NOAA-TM-ERL-PMEL-51; NOAA-84051702) Avail: NTIS HC A02/MF A01 CSCL 04B

Estimated geostrophic winds from surface isobar spacing and orientation are compared with the winds actually encountered at Bear Creek, Alaska. The isobaric orientation (or direction) at which the flow through the pass reverse direction is noted. Examination of winds at stations near the mouths of other coastal mountain passes gave speeds roughly one-half of the geostrophic indication, suggesting (in view of the smaller pass area above the mouth) that the speeds in the passes are roughly comparable to those found at Bear Creek. Author (GRA)

N84-31896*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
DOPPLER-RADAR OBSERVATION OF THE EVOLUTION OF DOWNDRAFTS IN CONVECTIVE CLOUDS
Nehzat Motallebi 1982 145 p refs

(Grants NsG-5011; NSF ATM-76-83361)
(NASA-CR-173874; NAS 1.26:173874; ASP-355) Avail: NTIS HC A07/MF A01 CSCL 04B

A detailed analysis of the 20 July 1977 thunderstorm complex which formed and evolve over the South Park region in Central Colorado is presented. The storm was extensively analyzed using multiple Doppler radar and surface mesonet data, developed within an environment having very weak wind shear. The storm owed its intensification to the strength of the downdraft, which was nearly coincident with the region where the cloud had grown. The noteworthy features of this storm were its motion to the right of the cloud-level winds, its multicellular nature and discrete propagation, its north-south orientation, and its relatively large storm size and high reflectivity factor (55 dBZ). This scenario accounts for the observed mesoscale and cloud-scale event. A line of convergence was generated at the interface between the easterly upslope winds and westerly winds. During stage II, the convergence line subsequently propagated down the slopes of the Mosquito Range, and was the main forcing mechanism for the development of updraft on the west flank of the storm. The formation of downdraft on the eastern side of updraft blacked surface inflow, and created a detectable gust front. As the original downdraft intensified, the accumulation of evaporatively-chilled air caused the intensification of the mesohigh, which likely destroyed the earlier convergence line and created a stronger convergence line to the east, which forced up-lifting of the moist, westerly inflow and caused the formation of updraft to the east. An organized downdraft circulation, apparently maintained by precipitation drag and evaporational cooling, was responsible in sustaining a well-defined gust front. The storm attained its highest intensity as a consequence of merging with a neighboring cloud. The interaction of downdrafts or gust fronts from two intense cells appeared to be the primary mechanism of this merging process as suggested by Simpson et al. (1980). The merging process coincided with more rain than occurred in unmerged echoes. Author

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-31897# Sippican Ocean Systems, Inc., Marion, Mass.
EXPENDABLE CURRENT PROFILER (XCP, MOD 7) Final Report
R. W. Lancaster 30 May 1984 116 p
(Contract N00014-82-C-0438)
(AD-A142936; R-1385) Avail: NTIS HC A06/MF A01 CSCL 08/3

Sippican was funded to develop, build and test a factory produceable version of the expendable current profiler (XCP). It had been previously demonstrated that horizontal ocean currents may be measured by means of a free-falling expendable device. Although the results of their research demonstrated the viability of the concept, the probes were difficult to manufacture in a production environment. The XCP, Mod-7 design departed from all previous probe designs by including two major subassemblies: a buoy that remains at the ocean's surface has been added, linked to the descending probe assembly by two conductor, 39 gauge BT wire. Data gathered and pre-processed within the probe undergoes further processing in the buoy whereupon it is transmitted to receiving equipment via a radio frequency link. GRA

N84-31898# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
DISCUSSION OF THE IONIAN AND LEVANTINE SEAS
Tom Sawyer Hopkins 1983 42 p refs Presented at the NATO Workshop on Atmospheric and Oceanic Circulation in the Mediterranean Basin, Santa Teresa, Italy, 7-14 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-011562; BNL-34653; CONF-8309237-1) Avail: NTIS HC A03/MF A01

The Levantine Intermediate Water (LIW) is the most critical water mass in the thermohaline heart of the Mediterranean. It is comprised of North Atlantic Water (NAW) which was transformed to salty water (36.2 to 39.2 ppt). In the eastern Mediterranean (EMED) the NAW changes to a warm saline surface layer and a cool less saline layer. Much of the LIW is produced from winter cooling of surface waters. The distribution is patchy, dependant on original surface type, circulation, and atmospheric exposure. Convective depths range to 400 m. The densest water is not necessarily correlated with the deepest convective layers. Survival of the LIW depends on circulation and density. The circulation of the EMED is barotropically controlled by sea level. The annual low frequency signal is a trough extending zonally south of center and deepening eastward. The resulting cyclonic circulation is skewed to the south and east. The westerly winds exaggerate the African eastwad coastal flow. Wind stress, positive curl in northern Levantine and negative curl in the Gulf of Sirte, contribute to the circulations. DOE

N84-31899# Science Applications, Inc., Raleigh, N.C.
SOUTH ATLANTIC PHYSICAL OCEANOGRAPHY STUDY (YEAR 5). VOLUME 1: EXECUTIVE SUMMARY Final Report
L. Atkinson, O. Brown, T. Curtin, P. Hamilton, T. Lee, L. Pietrafesa, and E. Waddell Feb. 1984 19 p
(Contract DI-14-12-0001-29201)
(PB84-187855; MMS/AT/ES-84/13) Avail: NTIS HC A02/MF A01 CSCL 08J

Between 1977 and 1984 a physical oceanographic field measurement and data interpretation and synthesis program was conducted for an area extending alongshore from approximately Cape Hatteras to Cape Canaveral and offshore cross the shelf and the Blake Plateau. Emphasis was on shelf and shelf-break processes. Primary measurements made or used extensively in one or more program years include: subsurface currents/temperature, regional/seasonal hydrography, satellite thermal imagery, coastal water levels, and coastal and marine winds. Conditions on the shelf in the Georgia embayment are emphasized. Results describe Gulf Stream impacts on regional or process specific circulation patterns, e.g., Gulf Stream meanders and boundary eddies or filaments. The response of shelf currents and water level to tidal and wind stress forcing mechanisms are also described. GRA

N84-31900# National Environmental Satellite Service, Washington, D. C.
MONITORING OF LONG WAVES IN THE EASTERN EQUATORIAL PACIFIC 1981-1983 USING SATELLITE MULTI-CHANNEL SEA SURFACE TEMPERATURE CHARTS
R. Legeckis and W. Pichel Apr. 1984 142 p refs
(PB84-190487; EPOCS/CONTRIB-841; NOAA/TR/NESDIS-8; NOAA-84050701) Avail: NTIS HC A07/MF A01 CSCL 08J

The contents include: multi-channel sea surface temperature (MCSST) procedure; summary of 1981 to 1983 satellite observations; MCSST contour charts in the Eastern Equatorial Pacific; equatorial long waves in the MCSST analysis; MCSST time series in the Eastern Equatorial Pacific; and noise in NOAA-7 AVHRR channel 3. GRA

N84-31901# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Natural Disasters.
JAPAN SEA CENTRAL REGION TSUNAMI OF 26 MAY 1983. A RECONNAISANCE REPORT
L. S. Hwang (Tetra Tech, Inc., Pasadena, Calif.) and J. Hammack (Florida Univ., Gainesville) 1984 42 p refs
(Grant NSF CEE-82-19358)
(PB84-194703; CETS-CND-026) Avail: NTIS HC A03/MF A01 CSCL 08J

The tsunami generated by the Japan Sea central region earthquake is discussed. A few seconds after noon on May 26, 1983 (Japan Standard Time), a major earthquake occurred in the Japan Sea about 100 km off the coast of Akita Prefecture, which is located in northeast Honshu, Japan. The earthquake had a magnitude of 7.7 on the Richter scale. Four individuals lost their

lives directly from the earthquake, and considerable property damage occurred, primarily from foundation failure as a result of soil liquefaction. The earthquake generated a tsunami that began striking the Japan coast approximately 12 minutes after the earthquake occurred. One hundred lives were lost as a consequence of the tsunami alone. The tsunami also caused significant flooding and property damage to coastal regions. GRA

N84-31902# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Physical Sciences, Mathematics and Resources.
AN OCEAN CLIMATE RESEARCH STRATEGY Final Report
Ferris Webster 1984 75 p refs
(Grant NSF OCE-82-12426)
(PB84-194828) Avail: NTIS HC A04/MF A01 CSCL 08J

This report appraises ocean climate research programs and is to be used as a guide in planning and administering ocean climate research within the National Climate Program and in the World Climate Research Program. It briefly describes and evaluates proposals for two large scale oceanographic research programs: the Interannual Variability of the Tropical Ocean and the Global Atmosphere (TOGA) and the World Ocean Circulation Experiment (WOCE). In addition, planning for large scale ocean heat flux experiments is reviewed. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-31903# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION
6 Jan. 1984 117 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UNE-84-001) Avail: NTIS HC A06

Publications, developments, and progress in international life science studies are presented. Topics discussed include: laser applications in medicine and its effects; age related responses to dehydration and hyperhydration, effects of cold exposure on erythrocyles; climate effects; heart rate changes in response to sensorimotor loads; correlation between individual and alpha rhythm parameters; stability of physiological and psychological function under extreme environmental conditions; and psychophysiological effects of monotonous activity. For individual titles, see N84-31904 through N84-31911.

N84-31904# Joint Publications Research Service, Arlington, Va.
MEDICAL APPLICATIONS OF LASERS c52
V. A. Milyushenko *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 25-28 Transl. into ENGLISH from Sov. Export (Moscow), v. 4, no. 145, 1983 p 54-56 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

A new trend in laser surgery was developed. Medical applications of lasers rely on the effect of biological tissue vaporization under high intensity radiation. Depending on the nature of intervention and the characteristic features of the organs which are operated on either continuous wave lasers or pulsed lasers with a pulse duration as short as a few nanoseconds are applied. Several laser units for medical applications were developed and are produced in quantity. E.A.K.

N84-31905# Joint Publications Research Service, Arlington, Va.
AGE-RELATED RESPONSES TO DE- AND HYPERHYDRATION Abstract Only c52
R. I. Ayzman *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 37 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 3, May - Jun. 1983 p 454-460 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

Age related responses to water deprivation (38-42h) and water loading (2.2% of body weight) were studied in children (4-11 years old) and young adults (18-22 years) on the basis of blood chemistries and urinalysis. It is indicated that in the older age groups, osmoregulation was the dominant factor during the first 16-18 h of water deprivation, while in the younger age group (4-6 years) volume regulation was the predominant physiologic response. Volume regulation became the dominant controlling factor in the other age groups in the late stages of deprivation (38th to 42nd h). Following water loading the osmo and volume regulating mechanisms interact in an age related fashion: the former predominates in the younger (4-6 years) group throughout the entire 210 min period of observation, while in the other groups the early response (120 min) consisted of volume regulation followed by osmoregulatory adjustments in the later stage. Plasma aldosterone increased in all groups in response to water deprivation and loading in direct proportion to age. However, in the youngest group (4-6 years) aldosterone levels decreased toward the end of deprivation, indicating functional exhaustion of the endocrine system. E.A.K.

N84-31906# Joint Publications Research Service, Arlington, Va.
EFFECTS OF WHOLE-BODY COLD EXPOSURE ON ERYTHROCYTE MORPHOLOGY Abstract Only c52
A. G. Marachev and A. V. Kornev *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 37-38 Transl. into ENGLISH from Arkhiv Patol. (Moscow), no. 9, Sep. 1983 p 11-18 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

The erythrocyte morphology of 3000 residents of the Soviet Far North, ranging in age from 17 to 52 years was studied. The group included natives and nonnatives with variable periods of residence; populations in Moscow and its environs studied for control. Blood chemistries and scanning electron micrographs showed that the hemoglobin concentration and erythrocyte counts remain within the normal range as long as hypothermia does not develop; however, both parameters show reduction whenever cold is exacerbated. The latter conditions involve the appearance of many young and immature forms of erythrocytes and accelerated destruction of the mature forms, and the appearance of abnormal forms. These changes reflect the hypochromic anemia aspects of cold sickness. E.A.K.

N84-31907# Joint Publications Research Service, Arlington, Va.
EFFECTS OF CLIMATE ON KININOGEN LEVELS IN HEALTHY HUMAN SUBJECTS Abstract Only c52
S. Ch. Berkeliyeva *In its* USSR Rept.: Life Sci. Effect of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 38 Transl. into ENGLISH from Zdravookhr. Turkm. (Ashkhabad), no. 7, Jul. 1983 p 16-20 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

Effects of geophysical factors on kininogen levels in healthy human subjects were investigated in an arid region and in a temperate climate, and correlated with published findings on the effects of latitude and geomagnetic field on the same parameter. It is found that kininogen concentration increases from arid to temperate zones and also shows a positive correlation with increased amplitudes of short periodic variations in the horizontal components of the geomagnetic field from low to polar lattitudes. The vasoactive role of the kinins shows the involvement in the adaptation of the cardiovascular system to ambient geophysical conditions. E.A.K.

N84-31908# Joint Publications Research Service, Arlington, Va.
HEART RHYTHM CHANGES IN RESPONSE TO SENSORIMOTOR LOAD OF VARYING COMPLEXITY Abstract Only c52
Ye. I. Shulman, M. Yu. Geltsel, and M. B. Shpark *In its* USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 39 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 757-761 (For primary document see N84-31903 21-51)

Copyright. Avail: NTIS HC A06

Heart rhythm changes in response to sensorimotor load of varying complexity while carrying out a push button motor response were studied. In a semireclining position the subjects were exposed to one or two auditory stimuli and, depending on the quantity, quality, and time interval were required to carry out the appropriate response as instructed. Prior to sensorimotor stimuli the heart rate response to the auditory signal(s) consisted of a slight elongation of the first poststimulation R-R interval on the ECG, and recovery of normal R-R intervals at the expense of a shortened third R-R interval. In situations in which decision making was required, a statistically significant prolongation was seen in that R-R interval during which a decision to institute a motor response was made. The second and third R-R intervals were subject to prolongation and indicates that the start up of the response does not coincide with the decision making process itself, but with the final acceptance of the decision. E.A.K.

N84-31909# Joint Publications Research Service, Arlington, Va.
CORRELATION BETWEEN INDIVIDUAL ALPHA-RHYTHM PARAMETERS AND OPERATOR'S PERFORMANCE WHILE SUBJECTED TO MAXIMUM INFORMATION INPUT Abstract Only **c52**

S. Ye. Popov, A. V. Mirolyubov, and I. L. Solomin *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 42 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 865-866 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

A mathematical analysis was conducted on the correlation between alpha rhythms obtained by unipolar recordings from the right and left occipital areas and the performance of 12 male subjects, in a psychological adding test complicated by maximum information input to the subjects. A positive correlation prevailed between the mean period of the alpha waves in the right hemisphere and between the duration of the ascending positive phase with an increase in the frequency of errors, and with a decrease in the time required for onset of mental block. The two alpha rhythm parameters appeared to determine or reflect performance accuracy and immunity to acute mental fatigue. The duration of the descending negative phase and the mean period of the alpha waves in both hemispheres shows negative correlation with fluctuations in the error frequency, and reflects the degree of performance instability. E.A.K.

N84-31910# Joint Publications Research Service, Arlington, Va.
STABILITY OF PHYSIOLOGICAL AND PSYCHOLOGICAL HUMAN FUNCTIONS UNDER EXTREME ENVIRONMENTAL CONDITIONS Abstract Only **c52**

A. Slonim *In its* USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 43 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 873-875 (For primary document see N84-31903 21-51)
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Individual elements of physiological adaptation to extreme environments were described. Topics include: increased resistance to environmental changes ranging from the molecular to the population wide level, an analysis of specific and nonspecific elements of adaptation, and an evaluation of adaptational limitations. Ecological and evolutionary comparisons are used. The regulating and the regulated systems are considered. A hierarchic consideration of adaptational mechanisms is less successful since it is hard to classify energetic components, sensory components, information analysis, decision making, and motivational mechanisms on that basis. Behavioral adaptation is outlined and the interaction of adaptation and pathology is reported. A theoretical unifying concept for human adaptation is described. E.A.K.

N84-31911# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL ASPECTS OF MONOTONOUS HUMAN ACTIVITY Abstract Only **c53**

A. A. Kolodynskiy and V. V. Kolodynska` *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 61 Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR (Riga), no. 7, Jul. 1983 p 102-111 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

The psychophysiological correlates of monotonous mental and physical activity as it affects human performance are reviewed. The basic mechanisms underlying the negative consequences of such sensory monotony involve activation of the right cerebral hemisphere with simultaneous deactivation of the left hemisphere and motor asymmetry. The activation of the right hemisphere, particularly the posterior temporal area, and the concomitant inverse change in the left one may be key factors leading to perturbation of interhemispheric neurodynamics and suboptimal selfregulation in the brain, finding somatic manifestations as less efficient task performance. It is concluded that improvement of performance under such conditions may rest on the selective stimulation of the right and left hemispheres to ensure a near physiological functional balance. E.A.K.

N84-31912# SRI International Corp., Menlo Park, Calif.
USAFSAM (USAF SCHOOL OF AEROSPACE MEDICINE) REVIEW AND ANALYSIS OF RADIOFREQUENCY RADIATION BIOEFFECTS LITERATURE Interim Report, 17 Jun. 1983 - 16 Mar. 1984

L. N. Heynick and P. Polson May 1984 287 p
(Contract F33615-82-C-0610)
(AD-A142961; USAFSAM-TR-84-17; Rept-4) Avail: NTIS HC A13/MF A01 CSCL 06/18

The objectives of this project are to acquire, review, and analyze on an ongoing basis, information on research pertaining to the biological effects of radiofrequency radiation (RFR) for the preparation of a computer data base of analyses at the USAF School of Aerospace Medicine (USAFSAM). The method in use is to: (1) select documents judged to be representative of prior and current research on various RFR-bioeffects topics, (2) analyze in detail the contents of each such document, and (3) assess the validity and significance of the results presented. In this fourth report, the major RFR-bioeffects topics are listed and the format used for analyzing each selected document is described. During the period covered by this report, 42 additional analyses were completed, for a total of 160 analyses. The texts of the additional analyses are presented in Appendix A. In addition to the text, each analysis includes information for computer retrieval by authors, key words, year of publication, and RFR parameters. Appendixes B and C are two cumulative indexes to reference citations for all of the analyses completed thus far. In Appendix B, each citation is listed under each pertinent major topic. Appendix C comprises a cumulative list of citations in alphabetical order by first author and without regard to topic. Author (GRA)

N84-31913# New York Univ. Medical Center. Inst. of Environmental Medicine.
EFFECTS OF MICROWAVES ON CELL MEMBRANE PERMEABILITY Final Report, Jul. 1981 - Jun. 1984

R. P. Liburdy 2 Jul. 1984 69 p
(Contract N00014-81-K-0669)
(AD-A142979; FR-3) Avail: NTIS HC A04/MF A01 CSCL 06/18

The objective of this research project was to identify and characterize cell membrane responses to microwave radiation and, importantly, to determine specific conditions or modulators required for these responses. This study has revealed that membrane permeability changes in the erythrocyte and in liposome vesicles, as well as protein shedding in the erythrocyte, are induced by microwaves at the membrane phase transition, and that these responses are strongly dependent on plasma, oxygen tension, and antioxidant free radical scavengers. These findings provide new insight into both the physical and chemical nature of microwave radiation interaction with the cell membrane. GRA

N84-31914# Missouri Univ., Rolla. Dept. of Life Sciences.
EFFECTS OF RADIOFREQUENCY RADIATION ON DIF-

FERENTIATION OF ERYTHROLEUKEMIC CELLS Final Report, 2 Sep. 1982 - 1 Feb. 1984
R. F. Brown and S. V. Marshall May 1984 39 p
(Contract F33615-82-K-0634)
(AD-A143038; USAFSAM-TR-84-12) Avail: NTIS HC A03/MF A01 CSCL 06/18

A dose-response study was conducted to determine if chemically induced erythroid differentiation of murine erythroleukemic (MEL) cells is affected by continuous-wave radiofrequency (RF) radiation. RF exposures were at 1180 MHz in a specially constructed anechoic chamber equipped with a constant-temperature-air circulator designed to maintain the cell at 37.4 C. Experiments were performed at incident power densities of 5.5, 11, and 22 mW/sq cm, corresponding to SAR levels of 18.5, 37, and 74 W/kg, respectively. Four replicate experiments were conducted at each power level with two irradiated and two control cultures included in each replicate. Cultures were initiated by suspension of MEL cells in growth medium containing the inducer hexamethylene bisacetamide, 3 mM, in 10-cm cellulose nitrate tubes. One day after addition of the inducer, the cultures were placed in the exposure chamber and irradiated for 48 hr. Cells were then counted, resuspended in normal growth medium (no inducer), and incubation continued for 2 additional days. Number of cells undergoing erythroid differentiation was determined by staining with benzidine, a hemoglobin-specific reagent. Amount of hemoglobin present in lysates prepared from the differential cells was determined by a colorimetric procedure. GRA

N84-31915# Rose-Hulman Inst. of Tech., Terre Haute, Ind.
CONFERENCE GRANT FOR 2ND WORLD CONGRESS ON BIOMATERIALS Final Report
J. M. Anderson, ed. Jun. 1984 11 p Conf. held in Washington, D.C., 27 Apr. - 1 May 1984
(Contract N00014-84-G-0041; Grant DAMD17-84-G-4005)
(AD-A143129) Avail: NTIS HC A02/MF A01 CSCL 06/2

This document reports on the Second World Congress on Biomaterials held in Washington, D.C., on April 27 - May 1, 1984. GRA

N84-31916# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
6 Jun. 1984 94 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-84-012) Avail: NTIS HC A05/MF A01

Progress in the sciences, biomedical and behavioral sciences is reported. Topics discussed include: aerospace medicine, human factors engineering, laser effects, and clinical medicine. For individual titles, see N84-31917 through N84-31923.

N84-31917# Joint Publications Research Service, Arlington, Va.
FIRST MIXED CREW IN SPACE Abstract Only **c54**
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 1 Transl. into ENGLISH from Zdorovye (Moscow), no. 11, Nov. 1982 p 12-14 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

The Soyus T-7 flight was the first to include a woman crew member. Medical and biological changes during the flight were investigated. No significant differences were found in the physiological reactor of the females or males to the extreme factors of space flight. It is shown that women adapt more rapidly and successfully to hypokinesia than men. It is found that women are well suited for future, longer space flights. E.A.K.

N84-31918# Joint Publications Research Service, Arlington, Va.
ERGONOMIC ANALYSIS OF HUMAN OPERATION OF VIDEO TERMINAL Abstract Only **c54**
V. M. Bondarovskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 30 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 6-7 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

Ergonomics and video terminal systems were analyzed. The activity of the users of a number of editing systems was studied and fatigue was observed in 70% of cases after 2 hours of work. Recommendations were developed to improve the organization of labor of terminal users, which includes arrangement of information on the screen in a manner convenient for reading and for location of fragments of text rather than as a continuous sequence of characters, reduction in the quantity of information presented at one time, adjustment of computer response time to the user in accordance to the structure of the activity which is performed, and provisions of a reaction by the computer to virtually every action by the operator. Five to 10 minute breaks are recommended each 2 hours of work. E.A.K.

N84-31919# Joint Publications Research Service, Arlington, Va.
RESULTS OF PSYCHOPHYSIOLOGICAL STUDY OF VIDEOTON TERMINAL OPERATORS Abstract Only **c54**
O. A. Likhacheva, L. P. Stepanova, and V. K. Khukhlayev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 30-31 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 7-8 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

Studies were performed using a combination of methods including measurement of critical blinking frequency, reaction to sound, endurance and strength of the hands in order to determine the basic properties of the central nervous system during work with the Videoton computer terminal. Subjects were 18 to 33 years of age and had been working with the terminal for one month to 6 years. It was found that operator fatigue, headache and other symptoms are characteristic of CRT terminal workers and increase with an increase in the information load. The study did not answer whether the specific source of these sensations is the hardware itself, the blinking of the signal characters, the density of information on the screen or something else. E.A.K.

N84-31920# Joint Publications Research Service, Arlington, Va.
REALIZATION OF HUMAN WORK CAPACITY: INTERDISCIPLINARY PROBLEMS Abstract Only **c54**
B. S. Maryenko, K. R. Kopystyanskaya, and N. A. Titova *In its* USSR Rept.: Life Sci. Biomed and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 31 Transl. into ENGLISH from Visn. Akad. Nauk Ukr. RSR (Kiev), no. 1, Jan. 1984 p 25-33 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

Approaches to utilization of human work capacity are discussed from a psychophysiological and organizational point of view. In addition to relying on physiological and psychological testing of applicants for a position to determine their suitability, factors such as creating favorable work environments and rational work assignment and management are important. Optimum production and productivity can only be expected when all the factors pertinent to a given work situation are scientifically analyzed and evaluated. This also implies the need for periodic reassessment of both the health and attitudes of the workers, and of the changing job requirements. E.A.K.

N84-31921# Joint Publications Research Service, Arlington, Va.
STRESS IN WORK Abstract Only **c54**
K. M. Smirnov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 32 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 1, Jan-Feb. 1984 p 76-99 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

Labor physiology concerns itself with the state and activity of the human body during performance of some work. Concepts, terminology and general ideas of labor physiology are defined to distinquish between stress and strain. Work strain is discussed for general physical labor, local physical effort and nonphysical exertion. The effect of the environment and the cumulative effect of multiple factors on human performance are addressed. Evaluation criteria and possible normalization of labor stress are addressed. Data on labor stress and strain are a component of the

knowledge on human physiology and are considered in hygienic and ergonomic evaluations and productivity analyses. E.A.K.

N84-31922# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SOME ASPECTS OF MECHANISM OF ACTION OF HELIUM-NEON LASER Abstract Only c36
S. M. Zubkova, Z. A. Sokolova, V. I. Popov, and I. B. Laprun *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 40 Transl. into ENGLISH from Vop. Kurortol. Fiziolter. i Lech. Fiz. Kul. (Moscow), no. 6, Nov.-Dec. 1983 p 25-29 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

The action of laser radiation on enzymatic and free radical oxidation, structural and functional state of mitochondrial membranes and nuclear chromatine, RNA and glycogen content, morphometric cell factors was investigated. It is shown that laser radiation has a stimulating effect on metabolic processes directly in the irradiated tissue as well as in CNS which is shown by activation of energetic and plastic processes and by lowered free radical oxidation rate. General X-ray radiation led to destructive changes in the tissue. Preexposure to laser rays shows some protective effect in the directly irradiated tissue. Comparison of laser radiation with incoherent red light shows greater metabolic changes which occur after exposure to a laser beam. E.A.K.

N84-31923# Joint Publications Research Service, Arlington, Va.
IMMEDIATE EFFECTS OF HYPERBARIC OXYGENATION ON BODY OXYGEN SUPPLY Abstract Only c52
V. I. Buravtsov, A. N. Tulupov, I. P. Nikolayeva, S. A. Tatulyan, and A. L. Kostyuchenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 45 Transl. into ENGLISH from Anesteziol. i Reanim. (Moscow), no. 1, Jan-Feb. 1984 p 20-21 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

The effectiveness of hyperbaric oxygenation in patients with destructive pulmonary abscesses in improving body oxygen balance was studied. The therapeutic protocol called for 4-6 sessions in a pressure chamber with a pO2 of 152-183 kPa each session lasting for 30-45 min. Hemodynamic and biochemical studies demonstrated that therapy had no effect on pulmonary gas exchange, but the minute volume was decreased by 32% in patients with an elevated minute volume. Despite diminished oxygen transport, blood flow and arteriovenous difference in oxygen tension, tissue oxygen balance improved as indicated by decreased serum lactate dehydrogenase activity and increased stability of erythrocyte suspensions and electrophoretic mobility of erythrocytes. It is indicated that, following hyperbaric oxygenation, energy expenditures for respiration and circulation are less stringent. E.A.K.

N84-31924# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
7 Aug. 1984 113 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-84-017) Avail: NTIS HC A06/MF A01

The current status of soviet research in medicine, agrotechnology, microbiology, human factors engineering, environmental studies, radiation effects, radiation biology, physiology, public health, and veterinary medicine are presented. Topics include surgical techniques, plant protection, bacterial identification, operator performance, environmental protection, effects of nonionizing electromagnetic radiation, medical equipment and facilities design, modelling systems, and disease prevention in animals. For individual titles, see N84-31925 through N84-31933.

N84-31925# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN INDEXES FOR MENTAL WORK CAPACITY AND PARAMETERS IN CIRCULATORY SYSTEM BEFORE AND AFTER PHYSICAL STRESS Abstract Only c52
N. I. Sapova and T. A. Pavlova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 43 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 897-901 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

The dynamics of mental work capacity following low level physical stress are investigated. Interval cardiograms and rheoencephalograms and integrated total body rheograms are made during the entire period of examinations (20-35 minutes). Respiratory volume is determined by spirometry. The arterial pressure and other circulatory parameters are also measured. Subjects perform tests involving the operational memory at rest and following ergometer stress. Complex physiological and psychophysiological indexes are assessed using the methods of Student and Wilcoxon with the aid of regression analysis. The findings indicate small but definite changes in cerebral circulation and cardiac rhythm in mental work one without substantial nervous/emotional tension and moderate election of mental work capacity following relatively mild physical work. It is concluded that in some cases light physical work of short duration is capable of enhancing mental work capacity. M.A.C.

N84-31926# Joint Publications Research Service, Arlington, Va.
EFFECT OF BODY TEMPERATURE ON HUMAN WORK CAPACITY Abstract Only c54
A. S. Pavlov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 43-44 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 963-968 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

Changes of a variety of indicators of physical and mental work capacity were investigated in trained and untrained persons at various levels of gradually developing muscular hyperthermia in the range of 1.5-2.0 deg. It is shown that in conditions of such hyperthermia the work-capacity indicator first increase by 108-112 percent and then decline. These results lead to the conclusion that an increase of body temperature under physical-load conditions is a positive phenomenon. (IAA)

N84-31927# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN CHARACTERISTICS OF EEG RHYTHMS IN BIOFEEDBACK CONTROL AND INDEXES FOR OPERATOR ACTIVITY Abstract Only c53
V. G. Markman, S.S. Kurguzov, and M. Z. Khandov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 44 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 994-998 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

The feasibility of predicting operator abilities on the basis of individual characteristics in conscious control of EEG rhythms is examined. After establishing baseline values for comparing the biofeedback control of EEG parameters and the ability to track a radar target on a laboratory simulator, tests are conducted in 160 subjects. Subjects are divided into two groups; one trained to increase the alpha rhythm, the other to reduce theta rhythm. Determinations are then made of the working characteristics of subjects as they solve problems on a radar tracking simulator. Results are shown for visual motor compensation tracking, conscious control of alpha rhythm and work on the radar simulator, and conscious control of alpha and theta rhythm control of EEG parammeters is not associated with time based assessments of operator skill. The indexes for biofeedback control of alpha rhythm enable prediction of success in operator task solving in extreme conditions. M.A.C.

N84-31928# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ASSESSMENT OF ROLE OF SPATIAL FREQUENCIES OF IMAGES IN VISUAL RECOGNITION OF NUMBERS Abstracts Only c53
Ye. D. Borisova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 45 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 999-1004 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

A quantitative evaluation is made of the role of the spatial

frequency component of the Fourier spectrum for symbols (figures) during the process of visual recognition. Actual images are used whose spectral composition is altered in accordance with the tasks set. After band elimination spatial filtering in a digital computer, and the spatial frquency above a predetermined level is clipped. The remaining part of the image is not distorted. Psychophysiological characteristics in recognition of the filtered images are studied using a tachistoscopic method. When spatial frequencies higher than 1.22 cycles per degree are filtered out, images are virtually unrecognizable. Image recognition patterns are retained when contrast is reduced within specific limits, but reduction of contrast causes lower correct recognition values when exposure time is reduced. M.A.C.

N84-31929# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN BLOOD CATECHOLAMINE LEVELS AND INDIVIDUAL FEATURES IN DYNAMICS OF OPERATOR ERROR Abstract Only c52
S. Ye. Popov and A. V. Mirolyubov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 45-46 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 1023-1024 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

At the biochemical level, activating mechanisms are supported by the adrenergic system, whose activeness can be used to determine the dynamics in operator work quality indexes. A comparative study is made of the catecholamine level in the peripheral blood and the periodicity of operator error. Findings indicate a regular association between the catecholamine level, the frequency of operator error and the activity of the central nervous system. Subjects with higher catecholamine levels and displaying greater activeness are able to cope with a greater information load. The catecholamine level and activeness seems to be associated only with the dynamic work indexes but not with the overall level of operator error. M.A.C.

N84-31930# Joint Publications Research Service, Arlington, Va.
CHANGES IN ARTERIAL PRESSURE IN STATIC WORK AS FUNCTION OF TIME OF DAY AND DEGREE OF DISTURBANCE IN EARTH'S MAGNETIC FIELD Abstract Only c52
V. A. Kuzmenko and A. B. Buluyev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 69 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 892-896 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

Changes in the arterial pressure in healthy subjects under various static muscular loads at different times of the day and different values for the geomagnetic field are compared. Measurements are made to determine systolic pressure and heart rate. Geomagnetic disturbance during measurements are assessed from data on the K-index. Circadian patterns in systolic pressure under static muscular load are established. A correlation is found between disturbances in the geomagnetic field and pressor response during segments of the circadian cycle when arterial pressure is normally lower. Changes in arterial pressure did not appear to be associated directly with physical load as correlated with geomagnetic disturbance or with any cardiac response. The range of possible changes in the arterial pressor response as a function of geomagnetic disturbance is commensurable with circadian changes in the excitation of circulatory regulation. M.A.C.

N84-31931# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FUNCTIONAL STATUS AND SUBJECTIVE SENSATIONS IN PROCESS OF HEAT ADAPTATION Abstract Only c52
A. T. Maryanovich, V. D. Bakharev, L. A. Gridin, and P. M. Yartsev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 74 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 956-962 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

Objective functional status and subjective sensations in heat acclimation are compared and correlated. Rectal temperature, heart rate, oxygen demand and carbon dioxide exhalation at rest and during physical exercise are recorded. Subject sensations are reported according to a 7 point scale. Objective and subjective findings are correlated using the Student methods for paired and unpaired samples. During the initial period of heat acclimation, improvement in the thermal status can be achieved through stressing the homeostatic mechanisms, without involving the cardiovascular system but involving increase in the sensation of discomfort. Two individual tactical approaches are possible during the period of heat acclimation in humans: (1) either stressing of the homeostatic mechanisms to reduce impairment of the thermal balance to a minimum, or (2) reducing stress and improving subjective sensations at the cost of elevated body temperature. The subsequent status in which both impairment of the thermal balance and the degree of discomfort experienced subjectively are reduced to a certain minimum level should be regarded as a sign of complete adaptation to the environment. M.A.C.

N84-31932# Joint Publications Research Service, Arlington, Va.
STUDY OF SPATIAL ASYMMETRY IN HUMAN EXTERNAL ELECTRICAL FIELD Abstract Only c52
Yu. V. Tornuyev and S. A. Kudelkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 75 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 969-973 Original language document previously announced in IAA as A84-15741 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

The ability to assess the turn angle of the forearm in the horizontal plane was investigated in two series of observations on 150 subjects. In the first series, the subject himself, without visual monitoring, moved his arm to a certain intermediate value specified by the researcher (active moment A); while in the second series the arm was moved by the researcher (passive movement P). It is shown that the Stevens function power distribution was normal in A movement but asymmetric in P movement. It is suggested that this heterogeneity is caused by an indeterminacy factor in the case of P movement. (IAA)

N84-31933# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSICS OF PROPRIOCEPTIVE SENSIBILITY Abstract Only c53
I. A. Rybin, A. N. sergeyeva, and A. P. Kasatov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 75-76 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 974-978 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

Results are presented from a study of subjective assessment of spatial shifts based on the sensory system of the musculoskeletal system. The ability of subjects to assess the angle of rotation of the forearm in the horizontal plane without visual control is investigated. Results are processed using the method of least squares. Results are presented in graphic and tabular form showing the distribution of subjects for the Stevens' function in active and passive movement compared with normal distribution, and the distribution of individual indexes for subjects in subgroups. Differences in active and passive movements are discussed and it is concluded that care should be taken with regard to the effectiveness of simulation training for sportsmen since development of motor skills is less adequate then in active training where learning to eliminate error promotes acquisition of a high level of resistance to nose in sensory signals. M.A.C.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-31934 California Univ., Santa Barbara.
SENSITIVITY TO HYPOXIA IN HUMANS Ph.D. Thesis

Fred Herbert Carlin 1983 254 p
Avail: Univ. Microfilms Order No. DA8401736

Evaluation of the work performed by others revealed shortcomings in the metrics used to assess human hypoxic drive. The concept of the strong hypoxic drive was developed as an improved assessment and was applied to the data collected from several subjects. The strong hypoxic response appears to be an acceptable measure of relative hypoxic drive, however, it is quite inappropriate for use in a model of ventilatory drive in the control systems sense. Therefore, a method was developed to compute the six coefficients for an arbitrary hyperbola fitting the experimental data. In order to efficiently determine these coefficients it was necessary to specify the asymptotes. The strong hypoxic response estimated one of the asymptotes and a similar technique was used to determine the other asymptote. The second asymptote is termed the weak hypoxic response because it most closely matches the ventilation in the euoxic region. Additional work is indicated to either substantiate the usefulness of the new measures, or determine if some other measure is in fact of higher merit.
Dissert. Abstr.

N84-31935*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PULMONARY ARTERY LOCATION DURING MICROGRAVITY ACTIVITY: POTENTIAL IMPACT FOR CHEST-MOUNTED DOPPLER DURING SPACE TRAVEL
Arthur T. Hadley, III, Johnny Conkin (Technology, Inc., Houston, Tex.), James M. Waligora, and David J. Horrigan, Jr. Aug. 1984 8 p refs
(Contract NAS9-17200)
(NASA-TM-58262; S-538; NAS 1.15:58262) Avail: NTIS HC A02/MF A01 CSCL 06E

Doppler, or ultrasonic, monitoring for pain manifestations of decompression sickness (the bends) is accomplished by placing a sensor on the chest over the pulmonary artery and listening for bubbles. Difficulties have arisen because the technician notes that the pulmonary artery seems to move with subject movement in a one-g field and because the sensor output is influenced by only slight degrees of sensor movement. This study used two subjects and mapped the position of the pulmonary artery in one-g, microgravity, and two-g environments using ultrasound. The results showed that the pulmonary artery is fixed in location in microgravity and not affected by subject position change. The optimal position corresponded to where the Doppler signal is best heard with the subject in a supine position in a one-g environment. The impact of this result is that a proposed multiple sensor array on the chest proposed for microgravity use may not be necessary to monitor an astronaut during extravehicular activities. Instead, a single sensor of approximately 1 inch diameter and mounted in the position described above may suffice. Author

N84-31936*# Stanford Univ., Calif. Cardiology Div.
PHARMACOLOGIC COUNTER MEASURES MINIMIZING POST-SPACE FLIGHT ORTHOSTATIC INTOLERANCE Interim Report
Donald C. Harrison and Robert Kates Mar. 1982 14 p
(Contract NCC2-232)
(NASA-CR-173861; NAS 1.26:173861) Avail: NTIS HC A02/MF A01 CSCL 06E

The effect of bed rest on drug disposition and physiological function was investigated as part of a project to determine the cardiovascular effects of space flight. One group of subjects was given doses of lidocane, penicillin-G, and ICG during a control period and following seven days of bed rest. Cardiac function was evaluated by echo-cardiography. Renal function was evaluated in a second group before and after several days of bed rest. Inulin, para-aminohippurate, and dextran clearances were studied. In the first group, the post-bed rest parameters were not statistically different from the pre-bed rest valves. In the second study, renal function did not change significantly after seven days of bed rest. Plans for future research are reviewed. R.S.F.

N84-31937# Norwegian Defence Research Establishment, Kjeller.
MODULATION OF THE CHOLINERGIC MECHANISMS IN THE BRONCHIAL SMOOTH MUSCLE Ph.D Thesis
Pal Aas Jun. 1984 110 p refs
(NDRE/PUBL-84-1001; ISSN-0800-4412) Avail: NTIS HC A06/MF A01

It is shown that cholinergic nerves to the bronchial smooth muscle were modulated by several independent mechanisms. The release of acetylcholine (Ach) was regulated by presynaptic muscarinic receptors and by adenosine. The presynaptic regulation of release is shown to operate in addition to the postsynaptic stimulation of the bronchial smooth muscle. The function of the cholinergic nervous system in bronchi and the lungs is dependent upon the activities of acetylcholinesterase and cholinesterases, which exhibited rather high activities in the tissues. Serotonin, which is stored in and released from pleural mast cells, potentiated the release of Ach and thereby the contraction of the bronchial smooth muscle. In addition to the presynaptic effect, there was a postsynaptic stimulatory response to serotonin. Special attention was paid to the peptide neurotensin, which potentiated both the release of Ach and stimulated the muscle to contract by postsynaptic receptors. The release of serotonin and histamine from rat pleural mast cells was specifically induced. Author

N84-31938# Brown Univ., Providence, R. I. Dept. of Physics.
CORRELATION OF AFFERENT ACTIVITY AND BINOCULAR RECEPTIVE FIELD PROPERTIES
M. A. Paradiso and L. N. Cooper 13 Jul. 1984 34 p
(Contract N00014-81-K-0136; NR Proj. 201484)
(AD-A143087; TR-15) Avail: NTIS HC A03/MF A01 CSCL 06/16

A theoretical model of synaptic plasticity is used to examine the importance of the correlation of left eye and right eye afferent activities for the development of binocular receptive field properties in visual cortex. Generally, cortical cells that receive less binocularly correlated activity become less binocular. We argue that larger disparity decreases correlation and larger receptive field size increases correlation. Therefore, the consequences of normal uncorrelated activity are: first, disparity selective neurons that are optimally stimulated at the horopter tend to be more binocular than cells selective for nonzero disparities. Second, cortical cells with large receptive fields tend to be more binocular and can maintain larger disparities than small-field cells. Third, low levels of uncorrelated activity allow changes in ocular dominance that accentuate any ocular dominance organization present prior to visual experience. The model also readily accounts for the loss of binocularity caused by monocular deprivation, alternating occlusion, and strabismus. GRA

N84-31939# Civil Aeromedical Inst., Oklahoma City, Okla.
ANTHROPOMETRIC AND MASS DISTRIBUTION CHARACTERISTICS OF THE ADULT FEMALE, REVISED
J. W. Young, R. F. Chandler, C. C. Snow, K. M. Robinette (AF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio), G. F. Zehner (Anthropology Research Project, Inc., Yellow Springs, Ohio), and M. S. Lofberg (USAF Hospital George, Calif.) Sep. 1983 109 p Supersedes N84-18896
(AD-A143096; FAA-AM-83-16-REV) Avail: NTIS HC A06/MF A01 CSCL 06/14

This study of 46 living adult females is part of a long-range research program designed to establish valid analytical relationships between readily measured body dimensions and mass distribution characteristics of living populations. Presented in this report are data describing the mass distribution characteristics of primary and composite body segments. The report also contains sets of regression equations which can be used to predict segmental volumes and moments of inertia from anthropometric data. The data base is derived from both classical anthropometric measurements and from stereophotogrammetric techniques. Subjects were representative of a general United States population

as defined by the 1971-74 Public Health Service, Health and Nutrition Examination Survey (HANES). The data obtained describe segment and segment composite volumes, centers of volume, intersegment cut centroids, principal inertial axes, and surface anatomical landmarks with respect to anatomical axes developed for each segment. Experiments designed to test the validity of research techniques and controls, and to measure the differences between stereophoto-metrically derived values and values obtained by direct measurement techniques are also described here. GRA

N84-31940# Militair Hospitaal Dr. A. Mathijsen, Utrecht (Netherlands). Afdeling: Ooghelkunde.
OPHTHALMOLOGICAL INVESTIGATION AMONG CONTACT LENS WEARERS IN MILITARY SERVICE [OOGHEELKUNDIG ONDERZOEK BIJ CONTACTLENSDRAGERS IN DE MILITAIRE DIENST]
A. J. P. Rouwen Dec. 1983 62 p refs In DUTCH; ENGLISH summary
(Contract A82/K/100)
(Rept-AR/MHAM-1983-1; TDCK-78936) Avail: NTIS HC A04/MF A01

Data concerning visual acuity, refraction and biomicroscopy of 644 recruits with contact lenses are correlated with the type of lenses worn (conventional hard, gas permeable hard, and soft). The gas permeable hard contact lenses provide good vision with minimal corneal distortion and less complications compared to soft contact lenses. Before and after a three weeks field exercice the same parameters were compared. Seventy-nine percent of all soldiers wore their lenses during the exercise. In this group only a slight increase in contact lenses associated ocular pathology is observed. Author (ESA)

N84-31229# Joint Publications Research Service, Arlington, Va.
INNOVATIONS IN COSMONAUT MEDICAL MONITORING, PHYSICAL CONDITIONING Abstract Only
V. Pishchik *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 25 Transl. from Med. Gazeta (Moscow), 11 Apr. 1984 p 3 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

N84-31230# Joint Publications Research Service, Arlington, Va.
MEDICAL RESEARCH IN FIRST 100 DAYS OF SALYUT-7 FLIGHT Abstract Only
V. Pishchik *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 42-43 Transl. into ENGLISH from Med. Gazeta (Moscow), 18 May 1984 p 4 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

N84-31234# Joint Publications Research Service, Arlington, Va.
HYPOKINESIA EXPERIMENT STUDIES EFFECTS OF WEIGHTLESSNESS Abstract Only
G. Lomanov *In its* USSR Rept.: Space (JPRS-USP-84-004) 22 Aug. 1984 p 80-81 Transl. into ENGLISH from Sots. Industr. (Moscow), 24 Mar. 1984 p 4 (For primary document see N84-31228 21-12)
Copyright. Avail: NTIS HC A07

N84-31904# Joint Publications Research Service, Arlington, Va.
MEDICAL APPLICATIONS OF LASERS
V. A. Milyushenko *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 25-28 Transl. into ENGLISH from Sov. Export (Moscow), v. 4, no. 145, 1983 p 54-56 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31905# Joint Publications Research Service, Arlington, Va.
AGE-RELATED RESPONSES TO DE- AND HYPERHYDRATION Abstract Only
R. I. Ayzman *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 37 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 3, May - Jun. 1983 p 454-460 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31906# Joint Publications Research Service, Arlington, Va.
EFFECTS OF WHOLE-BODY COLD EXPOSURE ON ERYTHROCYTE MORPHOLOGY Abstract Only
A. G. Marachev and A. V. Kornev *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 37-38 Transl. into ENGLISH from Arkhiv Patol. (Moscow), no. 9, Sep. 1983 p 11-18 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31907# Joint Publications Research Service, Arlington, Va.
EFFECTS OF CLIMATE ON KININOGEN LEVELS IN HEALTHY HUMAN SUBJECTS Abstract Only
S. Ch. Berkeliyeva *In its* USSR Rept.: Life Sci. Effect of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 38 Transl. into ENGLISH from Zdravookhr. Turkm. (Ashkhabad), no. 7, Jul. 1983 p 16-20 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31908# Joint Publications Research Service, Arlington, Va.
HEART RHYTHM CHANGES IN RESPONSE TO SENSORIMOTOR LOAD OF VARYING COMPLEXITY Abstract Only
Ye. I. Shulman, M. Yu. Geltsel, and M. B. Shpark *In its* USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 39 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 757-761 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31909# Joint Publications Research Service, Arlington, Va.
CORRELATION BETWEEN INDIVIDUAL ALPHA-RHYTHM PARAMETERS AND OPERATOR'S PERFORMANCE WHILE SUBJECTED TO MAXIMUM INFORMATION INPUT Abstract Only
S. Ye. Popov, A. V. Mirolyubov, and I. L. Solomin *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 42 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 865-866 (For primary document see N84-31903 21-51)
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N84-31910# Joint Publications Research Service, Arlington, Va.
STABILITY OF PHYSIOLOGICAL AND PSYCHOLOGICAL HUMAN FUNCTIONS UNDER EXTREME ENVIRONMENTAL CONDITIONS Abstract Only
A. Slonim *In its* USSR Rept.; Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 43 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 5, Sep. - Oct. 1983 p 873-875 (For primary document see N84-31903 21-51)
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N84-31923# Joint Publications Research Service, Arlington, Va.
IMMEDIATE EFFECTS OF HYPERBARIC OXYGENATION ON BODY OXYGEN SUPPLY Abstract Only
V. I. Buravtsov, A. N. Tulupov, I. P. Nikolayeva, S. A. Tatulyan, and A. L. Kostyuchenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 45 Transl. into ENGLISH from Anesteziol. i Reanim. (Moscow), no. 1, Jan-Feb. 1984 p 20-21 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31925# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN INDEXES FOR MENTAL WORK CAPACITY AND PARAMETERS IN CIRCULATORY SYSTEM BEFORE AND AFTER PHYSICAL STRESS Abstract Only
N. I. Sapova and T. A. Pavlova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 43 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 897-901 (For primary document see

N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31929# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN BLOOD CATECHOLAMINE LEVELS AND INDIVIDUAL FEATURES IN DYNAMICS OF OPERATOR ERROR Abstract Only
S. Ye. Popov and A. V. Mirolyubov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 45-46 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 1023-1024 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31930# Joint Publications Research Service, Arlington, Va.
CHANGES IN ARTERIAL PRESSURE IN STATIC WORK AS FUNCTION OF TIME OF DAY AND DEGREE OF DISTURBANCE IN EARTH'S MAGNETIC FIELD Abstract Only
V. A. Kuzmenko and A. B. Buluyev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 69 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 892-896 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31931# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FUNCTIONAL STATUS AND SUBJECTIVE SENSATIONS IN PROCESS OF HEAT ADAPTATION Abstract Only
A. T. Maryanovich, V. D. Bakharev, L. A. Gridin, and P. M. Yartsev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 74 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 956-962 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31932# Joint Publications Research Service, Arlington, Va.
STUDY OF SPATIAL ASYMMETRY IN HUMAN EXTERNAL ELECTRICAL FIELD Abstract Only
Yu. V. Tornuyev and S. A. Kudelkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 75 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 969-973 Original language document previously announced in IAA as A84-15741 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-32037# Tokyo Denki Univ. (Japan). Dept. of Electronic Engineering.
NONLINEAR DYNAMICS IN EXCITABLE NERVE MEMBRANES
Kazuyuki Aihara, Makoto Kotani, Hirokazu Noguchi, and Takashi Numaziri *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 29-34 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-31941# Rice Univ., Houston, Tex. Dept. of Psychology.
THE EFFECT OF INFORMATION DISPLAY FORMAT ON MULTIPLE-CUE JUDGMENT
S. P. Kerkar and W. C. Howell Jun. 1984 53 p
(Contract N00014-82-C-0001)
(AD-A142884; TR-84-2) Avail: NTIS HC A04/MF A01 CSCL 05/10

Since empirical evidence on the effects of display features in cognitive tasks is sparse, three studies were conducted to explore various aspects of the relationship. In all three, subjects were required to combine multiple predictive items (teacher attributes, applicant test scores) into overall evaluations (teacher effectiveness; qualification for a defined position) under conditions of either graphic or numerical display. Using the policy capturing methodology, in which multiple regression is used to model behavior, a description of individual judgment strategies was obtained. Display format was found to have a direct influence on the importance attached to (the weighting of) the separate pieces of information (viz., intelligence, etc.) in forming an overall evaluation. Moreover, simultaneous presentation of graphic information tended to produce holistic processing in contrast with the serial processing of numerical information. These findings appear to have important implications for the design of computer-based information processing systems. GRA

N84-31942# Tennessee Univ., Knoxville.
VARIABILITY OF PRACTICE AND THE TRANSFER OF TRAINING OF MOTOR SKILLS
C. A. Wrisberg and T. P. Winter Nov. 1983 50 p
(Contract MDA903-81-C-0216; DA Proj. 2Q1-61101-B-74-F)
(AD-A142896; ARI-TR-596) Avail: NTIS HC A03/MF A01 CSCL 05/9

The Training and Simulation Technical Area of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) maintains a program of research in support of the systems approach to training. A major focus of this program is the development of fundamental data and technology in the areas of skill acquisition, retention and transfer necessary for fielding training systems that improve individual job performance. Typically, soldiers are trained in service schools on only a portion of those tasks required for effective job performance. The remaining tasks are trained on the job once soldiers arrive in their operational units. Because unit training resources are limited, a primary goal of school training is to promote effective positive transfer of school-taught tasks to those additional tasks required on the job. Such transfer would reduce unit training demands and promote better on-the-job performance and associated combat readiness. This basic research report examines the effects of amount and variability of practice on the transfer of training of motor skills. The findings indicate that transfer improves with increased initial task training but that the effects of variety are task specific. GRA

N84-31911# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL ASPECTS OF MONOTONOUS HUMAN ACTIVITY Abstract Only
A. A. Kolodynskiy and V. V. Kolodynska *In its* USSR Rept.: Life Sci. Effects of Nonionizing Electromagnetic Radiation (JPRS-UNE-84-001) 6 Jan. 1984 p 61 Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR (Riga), no. 7, Jul. 1983 p 102-111 (For primary document see N84-31903 21-51)
Copyright. Avail: NTIS HC A06

N84-31927# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN CHARACTERISTICS OF EEG RHYTHMS IN BIOFEEDBACK CONTROL AND INDEXES FOR OPERATOR ACTIVITY Abstract Only
V. G. Markman, S.S. Kurguzov, and M. Z. Khandov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 44 Transl. into ENGLISH from Fiz. Cheloveka (Moscow). v. 9, no. 6, Nov.-Dec. 1983 p 994-998 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31928# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ASSESSMENT OF ROLE OF SPATIAL FREQUENCIES OF IMAGES IN VISUAL RECOGNITION OF NUMBERS Abstracts Only
Ye. D. Borisova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 45 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 999-1004 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-31933# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSICS OF PROPRIOCEPTIVE SENSIBILITY Ab-

stract Only
I. A. Rybin, A. N. sergeyeva, and A. P. Kasatov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 75-76 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 974-978 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

N84-32227# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
PILOT ORIENTED PERFORMANCE MEASUREMENT
J. DeMaio, H. H. Bell, and J. Brunderman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 27-31 (For primary document see N84-32223 21-81)
(AD-P003450) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32228# McDonnell-Douglas Electronics Co., St. Charles, Mo.
NEW CONCEPTS IN AIRCREW TRAINING USING COMPUTER GENERATED IMAGERY: A STUDY REPORT
D. Hauck and M. Verstegen *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 32-38 (For primary document see N84-32223 21-81)
(AD-P003451) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32235# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
VISUAL CUEING EFFECTIVENESS: COMPARISON OF PERCEPTION AND FLYING PERFORMANCE
J. DeMaio, E. J. Rinalducci (Georgia Inst. of Tech.), R. Brooks, and J. Brunderman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 92-96 (For primary document see N84-32223 21-81)
(AD-P003458) Avail: NTIS HC A17/MF A01 CSCL 05/9

N84-32242# Falcon Research and Development Co., Buffalo, N.Y.
MARINE CORPS GROUND SIMULATOR TRAINING NEEDS IN THE 1985-1995 TIME FRAME
P. Patti and J. Marlin (Marine Corps., Quantico, Va.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 127-139 (For primary document see N84-32223 21-81)
(AD-P003465) Avail: NTIS HC A17/MF A01 CSCL 15/5

N84-32261# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
TRAINING THE MULTIPLE-AIRCRAFT COMBAT ENVIRONMENT
P. A. Cook and C. L. Hanson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 350-355 (For primary document see N84-32223 21-81)
(AD-P003495) Avail: NTIS HC A17/MF A01 CSCL 05/9

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-31943 Ohio State Univ., Columbus.
MODELING, CONTROL AND SIMULATION OF THREE-DIMENSIONAL ROBOTIC SYSTEMS WITH APPLICATION TO BIPED LOCOMOTION Ph.D. Thesis
Yuan-Feng Zheng 1984 197 p refs
Avail: Univ. Microfilms Order No. DA8410448

A three dimensional, five link biped system is established. Newton/Euler state space formulation is employed to derive the equations of the system. The constraint forces involved in the equations can be eliminated by projection onto a smaller state space system for deriving advanced control laws. A model referenced adaptive control scheme is developed to control the system. Impact effects of biped contact with the environment are modeled and studied. A mathematical model of the skeletal muscle is discussed. A physical threshold model is proposed for recruitment which encompasses the size principle, its manifestations and exceptions to the size principle. Dissert. Abstr.

N84-31944*# Martin Marietta Corp., Denver, Colo.
TELEOPERATOR HUMAN FACTORS STUDY Progress Report, 8 May - 8 Jun. 1984
Jun. 1984 3 p
(Contract NAS8-35184)
(NASA-CR-171120; NAS 1.26:171120; MCR-83-607) Avail: NTIS HC A02/MF A01 CSCL 05H

The progress made on the Teleoperator Human Factors Study program is summarized. Technical and programmatic problems that were encountered were discussed along with planned activities. The report contains four sections: Work Performed, Future Work, Problems Encountered, and Cost Information R.S.F.

N84-31945*# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
RESEARCH ON COMPUTER AIDED TESTING OF PILOT RESPONSE TO CRITICAL IN-FLIGHT EVENTS Final Report, 1 Jan. 1983 - 31 Mar. 1984
Walter C. Giffin, Thomas H. Rockwell, and Phillip J. Smith 1 Jun. 1984 277 p refs
(Grant NAG2-112)
(NASA-CR-173871; NAS 1.26:173871) Avail: NTIS HC A13/MF A01 CSCL 05H

Experiments on pilot decision making are described. The development of models of pilot decision making in critical in flight events (CIFE) are emphasized. The following tests are reported on the development of: (1) a frame system representation describing how pilots use their knowledge in a fault diagnosis task; (2) assessment of script norms, distance measures, and Markov models developed from computer aided testing (CAT) data; and (3) performance ranking of subject data. It is demonstrated that interactive computer aided testing either by touch CRT's or personal computers is a useful research and training device for measuring pilot information management in diagnosing system failures in simulated flight situations. Performance is dictated by knowledge of aircraft sybsystems, initial pilot structuring of the failure symptoms and efficient testing of plausible causal hypotheses. E.A.K.

N84-31946# Inflation Systems International, Canyon Country, Calif.
DEVELOPMENT, TEST AND DELIVERY OF SOLID PROPELLANT GENERATORS FOR INFLATION OF PFD'S Final Report, Oct. 1980 - Oct. 1981
Gordon Holcombe, Brian Hamilton, and Terry Borland 22 Oct. 1981 59 p refs
(Contract DTCG-23-80-C-20031)
(AD-A1300477; USCG-D-31-82) Avail: NTIS HC A04/MF A01 CSCL 21/9

The objective of the program is to develop and test solid propellant gas generation system as a practical replacement for CO2 caratridges for inflatable life jackets and/or hybrid life jackets, with enhanced reliability and performance over a temperature range of -65 F to 185 F. To document comparative performance of the CO2 and solid propellant systems, test beds of 20 lb. and 35 lb. byoyancy inflatables are employed. Repetitive tests are made of each system, over the indicated environmental span, with specimens subjected to shock, vibration, cycling, and many other tests necessary to prove functional and life savings reliability and capability. The solid propellant inflator (SPI) test results reflect uniform performance across the temperature range at time/pressure levels considered ideal for the usage. The CO2 cartridge performance was poor at soak temperatures below 20 F and above 150 F. As the SPI is pressured only upon activation, leakage

during storage is not possible. Operating pressure is under 500 psi and a small overpressure device negates the possibility of overpressure stress from a blocked orifice condition. It is concluded that the SPI represents a significant improvement in the inflation of life jackets and similar buoyant devices having the need for prompt, reliable, fail/safe performance. Author

N84-31947# California Univ., Los Angeles.
MEASUREMENT AND MODIFICATION OF SENSORIMOTOR SYSTEM FUNCTION DURING VISUAL-MOTOR PERFORMANCE Annual Technical Report, 30 Sep. 1982 - 29 Sep. 1983
M. B. Sterman Apr. 1984 10 p
(Grant AF-AFOSR-0335-82)
(AD-A142919; AFOSR-84-0520TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Studies conducted during the initial phase of this project had two major objectives. The first was the selection of a visual-motor performance task that met the needs of (1) long term operation, (2) physiological and functional appropriateness, (3) relevance to the Air Force mission, and (4) feasibility within the resources available to us. Towards this end four video games were tested on each of six adult subjects. Evaluation of these tasks as well as EEG correlates of performance led to the selection of one for subsequent studies. Our second objective was to determine if the quantitative analysis of somatosensory EEG characteristics could yield information predictive of performance. Preliminary findings indicate that specific frequency components do, indeed, change in relation to response accuracy and speed. These consistent observations provided support for our basic assumptions and will guide the focus of subsequent studies. GRA

N84-31948# Monroney (Mike) Aeronautical Center, Oklahoma City, Okla. Protection and Survival Lab.
UNIFORM MASS DISTRIBUTION PROPERTIES AND BODY SIZE APPROPRIATE FOR THE 50 PERCENTILE MALE AIRCREW-MEMBER, 1980 - 1990
R. F. Chandler and J. Young 27 Mar. 1981 21 p
(AD-A142946; AAC-119-81-4) Avail: NTIS HC A02/MF A01 CSCL 05/5

The design and anaysis of aircraft seating, restraint and interior systems requires careful consideration of human factors relating to the mission to be performed and to the characteristics of the occupant. If comparisons are to be made among different system concepts, it is desirable to have a uniform basis for describing the characteristics of the human occupant and of any tools used as a human surrogate in the design, analysis or evaluation of the system. To this end, the U.S. Army Aeromedical Research Laboratory initiated an effort for the promotion of a tri-service Standard Man military specification in February 1980. The immediate goal of that effort was to develop a specification for body dimensions, joint locations, sitting heights, and mass distribution of military aircrewmen. A meeting was held in March 1980 to discuss this effort and to establish a program to accomplish the work. GRA

N84-31917# Joint Publications Research Service, Arlington, Va.
FIRST MIXED CREW IN SPACE Abstract Only
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 1 Transl. into ENGLISH from Zdorovye (Moscow), no. 11, Nov. 1982 p 12-14 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31918# Joint Publications Research Service, Arlington, Va.
ERGONOMIC ANALYSIS OF HUMAN OPERATION OF VIDEO TERMINAL Abstract Only
V. M. Bondarovskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 30 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 6-7 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31919# Joint Publications Research Service, Arlington, Va.
RESULTS OF PSYCHOPHYSIOLOGICAL STUDY OF VIDEOTON TERMINAL OPERATORS Abstract Only
O. A. Likhacheva, L. P. Stepanova, and V. K. Khukhlayev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 30-31 Transl. into ENGLISH from Prib. i Sistemy Uprav. (Moscow), no. 7, Jul. 1983 p 7-8 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31920# Joint Publications Research Service, Arlington, Va.
REALIZATION OF HUMAN WORK CAPACITY: INTERDISCIPLINARY PROBLEMS Abstract Only
B. S. Maryenko, K. R. Kopystyanskaya, and N. A. Titova *In its* USSR Rept.: Life Sci. Biomed and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 31 Transl. into ENGLISH from Visn. Akad. Nauk Ukr. RSR (Kiev), no. 1, Jan. 1984 p 25-33 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31921# Joint Publications Research Service, Arlington, Va.
STRESS IN WORK Abstract Only
K. M. Smirnov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-012) 6 Jun. 1984 p 32 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 1, Jan-Feb. 1984 p 76-99 (For primary document see N84-31916 21-51)
Avail: NTIS HC A05/MF A01

N84-31926# Joint Publications Research Service, Arlington, Va.
EFFECT OF BODY TEMPERATURE ON HUMAN WORK CAPACITY Abstract Only
A. S. Pavlov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-017) 7 Aug. 1984 p 43-44 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 9, no. 6, Nov.-Dec. 1983 p 963-968 (For primary document see N84-31924 21-51)
Avail: NTIS HC A06/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-31949*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A DEVICE-DEPENDENT INTERFACE FOR INTERACTIVE IMAGE DISPLAY
D. C. Perkins, M. R. Szczur, J. Owings, and R. K. Jamros May 1984 19 p refs
(NASA-TM-86136; NAS 1.15:86136) Avail: NTIS

HC A02/MF A01 CSCL 09B

The structure of the device independent Display Management Subsystem (DMS) and the interface routines that are available to the applications programmer for use in developing a set of portable image display utility programs are described. M.A.C.

N84-31950# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CRONUS, A DISTRIBUTED OPERATING SYSTEM: FUNCTIONAL DEFINITION AND SYSTEM CONCEPT Phase Report, Jun. 1981 - Jun. 1982
R. E. Schantz, M. D. Hoffman, W. I. MacGregor, and R. H. Thomas Griffiss AFB, N.Y. RADC Feb. 1984 120 p
(Contract F30602-81-C-0132)
(AD-A142795; BBN-5401; RADC-TR-83-254) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report details the functional definition and system concepts for Cronus, the local area network distributed operating system being developed as part of the DOS Design and implementation project sponsored by Rome Air Development Center. The report is the first project deliverable document and is intended as an overview of the system which we will be developing under this effort. The functions and system concepts discussed in this report are the results of a consideration of the current state of distributed system technology and potential uses of the system in a wide variety of command and control environments. Author (GRA)

N84-31951# California Univ., Livermore. Lawrence Livermore Lab.
THINKING BIG
Christopher P. Hendrickson 17 Feb. 1984 6 p refs Presented at the Seminar on How to Manage Data and Inform. as a Resource, Washington, D.C., 9-12 Apr. 1984
(Contract W-7405-eng-48)
(DE84-007412; UCRL-90392; CONF-840458-1) Avail: NTIS HC A02/MF A01

Superconductors have long been used at the nuclear weapons laboratories as very cost effective computational alternatives to large numbers of nuclear tests. This paper discusses the general characteristics of these supercomputers, gives an example of the environment in which these computers are placed, and indicates what future supercomputers will look like. DOE

N84-31952# California Univ., Livermore. Lawrence Livermore Lab.
DEC LSI-11/HP9895A SOFTWARE
R. N. Castleton 20 Apr. 1984 33 p refs
(Contract W-7405-eng-48)
(DE84-012412; UCID-20064) Avail: NTIS HC A03/MF A01

There is a need to exchange MSAD data between LLNL and Monsanto Research Corporation's Mound facility in Ohio. The LLNL tester is DEC LSI-11/23 based (as is all of the analysis software), and the Mound tester is HP9835 based. Data at Mound is stored on double density, double sided, HP-formatted 8 inch floppy disks. The software documented makes possible the reading of these data disks by a DEC LSI-11/23 using an HP9895A disk drive. DOE

N84-31124# Software Engineering Associates, Inc., Torrance, Calif.
OBJECT CODE OPTIMIZATION IN A STANDARD COMPILER
T. E. Devine *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 39-47 (For primary document see N84-31121 21-06)
(AD-P003520) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31136# Tartan Labs., Inc., Pittsburgh, Pa.
THE NEBULA STANDARD COMPUTER ARCHITECTURE
W. B. Dietz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 187-205 (For primary document see N84-31121 21-06)
(AD-P003532) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31151# Boeing Co., Seattle, Wash.
MIL-STD-1750A USERS GROUP
C. R. Turner and M. L. Wagner *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 385-394 (For primary document see N84-31121 21-06)
(AD-P003547) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31152# Fairchild Camera and Instrument Corp., Palo Alto, Calif. Advanced Research and Development Lab.
MIL-STD-1750A MICROPROCESSOR CHIP SET DEVELOPMENT
T. A. Longo and D. Wilnai *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 395-404 (For primary document see N84-31121 21-06)
(AD-P003548) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31153# McDonnell-Douglas Astronautics Co., Huntington Beech, Calif.
A HIGH PERFORMANCE MIL-STD-1750A MICROPROCESSOR
T. L. Rasset and J. H. Lane *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 405-411 (For primary document see N84-31121 21-06)
(AD-P003549) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31154# Rolm Corp., San Jose, Calif. MIL-SPEC Computer Div.
A MIL-STD-1750A COMPUTER EMPLOYING THE MDAC (MCDONNELL DOUGLAS ASTRONAUTICS CORPORATION) CMOS-SOS CHIPSET
C. F. Frank, Jr. and L. W. Speelman *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 413-427 (For primary document see N84-31121 21-06)
(AD-P003550) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31155# Mikros Systems Corp., Mercerville, N.J.
A NEW SILICON-ON-SAPPHIRE MIL-STD-1750A MICROPROCESSOR
J. R. Burns, H. Silcock, G. Portanova, and S. Nicholas *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 429-444 (For primary document see N84-31121 21-06)
(AD-P003551) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31156# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
THE USE OF COMPUTER ISA (INSTRUCTION SET ARCHITECTURES) AND SOFTWARE STANDARDS AT WESTINGHOUSE DEFENSE ELECTRONICS CENTER
M. A. Geyer, J. G. Gregory, and H. R. Moran, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 447-456 (For primary document see N84-31121 21-06)
(AD-P003552) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31158# Aerospace Corp., Los Angeles, Calif.
MIL-STD-1750A AS A SPACEBORNE INSTRUCTION SET ARCHITECTURE
R. N. Constant, R. C. Fleming, E. M. Garcia, M. Lubofsky, and D. R. OBell *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 479-491 (For primary document see N84-31121 21-06)
(AD-P003554) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31166# Martin Marietta Aerospace, Orlando, Fla.
STANDARDS AND INTEGRATED AVIONIC DIGITAL SYSTEM ARCHITECTURE
E. L. Griffin *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 563-581 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003561) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31168# IBM Federal Systems Div., Owego, N. Y.
STANDARD ISAs (INSTRUCTION SET ARCHITECTURES) AND VLSI (VERY LARGE SCALE INTEGRATION): TWO INTERACTING TRENDS

P. M. Kogge *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 597-609 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003563) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31172# Teledyne Systems Co., Northridge, Calif.
THE APPLICATION OF STANDARDS TO THE TDY-750 (TIGERSHARK) MISSION COMPUTER
D. W. Geyer *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 659-674 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003567) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31175# IBM Federal Systems Div., Bethesda, Md.
DEFENSE INDUSTRY ATTITUDES ABOUT AF INTERFACE STANDARDS REPORT OF AN ELECTRONICS INDUSTRIES ASSOCIATION SURVEY
P. N. Pocalyko and C. E. Swallow, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 721-727 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003570) Avail: NTIS HC A25/MF A01 CSCL 09/3

N84-31178# Rome Air Development Center, Griffiss AFB, N.Y.
A GENERAL PURPOSE COMPUTER ARCHITECTURE INVESTIGATION FACILITY
D. W. Gonzalez *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 767-776 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003573) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31179# Federal Electric Corp., Vandenberg AFB, Calif.
AN INTEGRATED APPROACH TO A SUCCESSFUL EMBEDDED COMPUTER RESOURCE PROJECT
L. G. Egan, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 777-812 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003574) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31186# General Electric Co., Syracuse, N.Y. Undersea Electronics Programs Dept.
ARCHITECTURE, HARDWARE AND SOFTWARE ISSUES IN FIELDING THE NEXT GENERATION DOD PROCESSORS
O. Golubjatnikov *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 899-925 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003581) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31190# Wright Aeronautical Corp., Paterson, N.J.
STANDARDIZED COMPUTING SYSTEM SDS80
J. Olsson *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 979-988 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003585) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31199# Intermetrics, Inc., Dayton, Ohio.
ARCHITECTURAL AND CONTROL CONSIDERATIONS FOR A HIGH SPEED SIGNAL PROCESSOR IMPLEMENTED WITH AN Ada (TRADEMARK) EXECUTIVE
S. E. Adams and T. R. Butler *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1097-1112 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003594) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-32252# Systems Productivity and Management Corp., Dayton, Ohio.
MICROPROCESSORS IN AIRCREW TRAINING DEVICES
R. J. Sylvester *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 287-294 (For primary document see N84-32223 21-81)
(AD-P003485) Avail: NTIS HC A17/MF A01 CSCL 09/2

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-31953 Illinois Univ., Urbana.
SOFTWARE DESIGN ISSUES IN THE IMPLEMENTATION OF HIERARCHICAL DISPLAY EDITORS Ph.D. Thesis
Afksendios Orailoglu 1983 136 p
Avail: Univ. Microfilms Order No. DA8410012

The advantages of language based editors do not supersede, but rather need to augment the advantages of text editors. An interface is presented that affords the user a dual conceptual framework of editing, i.e., both structural and textual. As structured editors are expensive in terms of space and time, ways are investigated to reduce the unnecessary costs. Incomplete grammars are examined and an implementation is offered which allows the users to specify grammars of interest partially. An implementation which allows user specification and partial specification of grammars is presented. The implementation affords all the simplicity and power of the textual model of editing, together with all the advantages of a language cognizant interface in a language independent fashion. Design questions for such an editor are examined and reported. Dissert. Abstr.

N84-31954*# Virginia Univ., Charlottesville. Dept. of Computer Science.
THE IMPLEMENTATION AND USE OF Ada ON DISTRIBUTED SYSTEMS WITH HIGH RELIABILITY REQUIREMENTS Semiannual Progress Report
John C. Knight Jul. 1984 36 p refs
(Grant NAG1-349)
(NASA-CR-173841; NAS 1.26:173841; UVA/528213/CS85/105)
Avail: NTIS HC A03/MF A01 CSCL 09B

The use and implementation of Ada in distributed environments in which reliability is the primary concern is investigated. Emphasis is placed on the possibility that a distributed system may be programmed entirely in ADA so that the individual tasks of the system are unconcerned with which processors they are executing on, and that failures may occur in the software or underlying hardware. The primary activities are: (1) Continued development and testing of our fault-tolerant Ada testbed; (2) consideration of desirable language changes to allow Ada to provide useful semantics for failure; (3) analysis of the inadequacies of existing software fault tolerance strategies. M.A.C.

N84-31955*# SoHaR, Inc., Los Angeles, Calif.
FAULT TOLERANT SOFTWARE MODULES FOR SIFT
Myron Hecht and Herbert Hecht Jul. 1982 78 p refs
(Contract NAS1-15428)
(NASA-CR-165874; NAS 1.26:165874) Avail: NTIS HC A05/MF A01 CSCL 09B

The implementation of software fault tolerance is investigated for critical modules of the Software Implemented Fault Tolerance (SIFT) operating system to support the computational and reliability requirements of advanced fly by wire transport aircraft. Fault tolerant designs generated for the error reported and global executive are examined. A description of the alternate routines, implementation requirements, and software validation are included. M.A.C.

N84-31956*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PILOT CLIMATE DATA SYSTEM USER'S GUIDE
Mary G. Reph, Lloyd A. Treinish, and Lewis Bloch Aug. 1984

145 p refs
(NASA-TM-86084; NAS 1.15:86084) Avail: NTIS HC A07/MF A01 CSCL 09B

Instructions for using the Pilot Climate Data System (PCDS), an interactive, scientific data management system for locating, obtaining, manipulating, and displaying climate-research data are presented. The PCDS currently provides this supoort for approximately twenty data sets. Figures that illustrate the terminal displays which a user sees when he/she runs the PCDS and some examples of the output from this system are included. The capabilities which are described in detail allow a user to perform the following: (1) obtain comprehensive descriptions of a number of climate parameter data sets and the associated sensor measurements from which they were derived; (2) obtain detailed information about the temporal coverage and data volume of data sets which are readily accessible via the PCDS; (3) extract portions of a data set using criteria such as time range and geographic location, and output the data to tape, user terminal, system printer, or online disk files in a special data-set-independent format; (4) access and manipulate the data in these data-set-independent files, performing such functions as combining the data, subsetting the data, and averaging the data; and (5) create various graphical representations of the data stored in the data-set-independent files. Author

N84-31957*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
SPECIFYING THE BEHAVIOR OF CONCURRENT SYSTEMS
Frederick C. Furtek 23 Jul. 1984 68 p refs
(Contract NASw-448)
(NASA-CR-173839; NAS 1.26:173839; CSDL-P-1915) Avail: NTIS HC A04/MF A01 CSCL 09B

A framework for rigorously specifying the behavior of concurrent systems is proposed. It is based on the view of a concurrent system as a collection of interacting processes but no assumptions are made about the mechanisms for process synchronization and communication. A formal language is described that permits the expression of a broad range of logical and timing dependencies. M.A.C.

N84-31958*# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
ANALYSIS OF SPACE TELESCOPE DATA COLLECTION SYSTEMS Final Report
Franklin M. Ingels Jul. 1984 146 p refs
(Contract NAS8-33570)
(NASA-CR-171129; NAS 1.26:171129) Avail: NTIS HC A07/MF A01 CSCL 09B

The Multiple Access (MA) communication link of the Space Telescope (ST) is described. An expected performance bit error rate is presented. The historical perspective and rationale behind the ESTL space shuttle end-to-end tests are given. The concatenated coding scheme using a convolutional encoder for the outer coder is developed. The ESTL end-to-end tests on the space shuttle communication link are described. Most important is how a concatenated coding system will perform. This is a go-no-go system with respect to received signal-to-noise ratio. A discussion of the verification requirements and Specification document is presented, and those sections that apply to Space Telescope data and communications system are discussed. The Space Telescope System consists of the Space Telescope Orbiting Observatory (ST), the Space Telescope Science Institute, and the Space Telescope Operation Control Center. The MA system consists of the ST, the return link from the ST via the Tracking and Delay Relay Satellite system to White Sands, and from White Sands via the Domestic Communications Satellite to the STOCC. S.B.

N84-31959*# Kentron, Inc., Arlington, Va.
ACCOUNTING UTILITY FOR DETERMINING INDIVIDUAL USAGE OF PRODUCTION LEVEL SOFTWARE SYSTEMS Final Report
Stacey C. Garber Jun. 1984 31 p refs
(Contract NAS1-16000)
(NASA-CR-172414; NAS 1.26:172414) Avail: NTIS HC A03/MF A01 CSCL 09B

An accounting package was developed which determines the computer resources utilized by a user during the execution of a particular program and updates a file containing accumulated resource totals. The accounting package is divided into two separate programs. The first program determines the total amount of computer resources utilized by a user during the execution of a particular program. The second program uses these totals to update a file containing accumulated totals of computer resources utilized by a user for a particular program. This package is useful to those persons who have several other users continually accessing and running programs from their accounts. The package provides the ability to determine which users are accessing and running specified programs along with their total level of usage. Author

N84-31960*# Systems and Applied Sciences Corp., Hyattsville, Md.
USER'S GUIDE FOR ERB 7 MATRIX. VOLUME 1: EXPERIMENT DESCRIPTION AND QUALITY CONTROL REPORT FOR YEAR 1
Richard J. Tighe and Maria Y. H. Shen 1984 197 p refs 2 Vol.
(Contract NAS5-28063)
(NASA-CR-170619; NAS 1.26:170619) Avail: NTIS HC A09/MF A01 CSCL 09B

The Nimbus 7 ERB MATRIX Tape is a computer program in which radiances and irradiances are converted into fluxes which are used to compute the basic scientific output parameters, emitted flux, albedo, and net radiation. They are spatially averaged and presented as time averages over one-day, six-day, and monthly periods. MATRIX data for the period November 16, 1978 through October 31, 1979 are presented. Described are the Earth Radiation Budget experiment, the Science Quality Control Report, Items checked by the MATRIX Science Quality Control Program, and Science Quality Control Data Analysis Report. Additional material from the detailed scientific quality control of the tapes which may be very useful to a user of the MATRIX tapes is included. Known errors and data problems and some suggestions on how to use the data for further climatologic and atmospheric physics studies are also discussed. S.B.

N84-31961*# Systems and Applied Sciences Corp., Hyattsville, Md.
NIMBUS 7 EARTH RADIATION BUDGET (ERB) MATRIX USER'S GUIDE. VOLUME 2: TAPE SPECIFICATIONS
S. N. Ray and K. L. Vasanth Apr. 1984 49 p 2 Vol.
(Contract NAS5-28063)
(NASA-CR-170620; NAS 1.26:170620) Avail: NTIS HC A03/MF A01 CSCL 09B

The ERB MATRIX tape is generated by an IBM 3081 computer program and is a 9 track, 1600 BPI tape. The gross format of the tape given on Page 1, shows an initial standard header file followed by data files. The standard header file contains two standard header records. A trailing documentation file (TDF) is the last file on the tape. Pages 9 through 17 describe, in detail, the standard header file and the TDF. The data files contain data for 37 different ERB parameters. Each file has data based on either a daily, 6 day cyclic, or monthly time interval. There are three types of physical records in the data files; namely, the world grid physical record, the documentation mercator/polar map projection physical record, and the monthly calibration physical record. The manner in which the data for the 37 ERB parameters are stored in the physical records comprising the data files, is given in the gross format section. Author

N84-31962*# Informatics General Corp., Palo Alto, Calif.
GUIDELINES FOR TESTING AND RELEASE PROCEDURES
Russell Molari and Mel Conway 15 Jan. 1984 73 p refs
(Contract NAS2-11555)
(NASA-CR-166581; NAS 1.26:166581) Avail: NTIS HC A04/MF A01 CSCL 09B

Guidelines and procedures are recommended for the testing and release of the types of computer software efforts commonly

performed at NASA/Ames Research Center. All recommendations are based on the premise that testing and release activities must be specifically selected for the environment, size, and purpose of each individual software project. Guidelines are presented for building a Test Plan and using formal Test Plan and Test Care Inspections on it. Frequent references are made to NASA/Ames Guidelines for Software Inspections. Guidelines are presented for selecting an Overall Test Approach and for each of the four main phases of testing: (1) Unit Testing of Components, (2) Integration Testing of Components, (3) System Integration Testing, and (4) Acceptance Testing. Tools used for testing are listed, including those available from operating systems used at Ames, specialized tools which can be developed, unit test drivers, stub module generators, and the use of format test reporting schemes. Author

N84-31963# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
APPLICATION OF AN ADAPTIVE NOISE TECHNIQUE ON STATE ESTIMATION TO DATA SMOOTHING [APLICACAO DE TECNICA DE RUIDO ADAPTATIVO EM ESTIMACAO DE ESTADO A SUAVIZACAO DE DADOS]
Valcir Orlando and Atair Rios Neto Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/50th Congr. Brasileiro de Automatica - 10 CLA/50 CBA, Campina Grande, Brazil, 3-6 Sep. 1984
(INPE-3187-PRE/552) Avail: NTIS HC A02/MF A01

Data smoothing by curve fitting, developed by the application of the Kalman filter combined with an adaptive technique of state noise evaluation, is presented. The use of a recursive sequential estimator in the curve fitting problem allows the development of two versions of the procedure: the first with batch data processing and the second with sequential data processing. Sequential data processing can give a real time processing capability to the fitting procedure. Neither version requires any matrix inversion. M.A.C.

N84-31964# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AUXILIARY PROGRAMS FOR THE METAL-ENCLOSED MICROSTRIPS PROJECT [PROGRAMAS DE APOIO PARA PROJETO DE MICROSTRIPS BLINDADAS]
Mauricio Garcia Chiarello Jul. 1984 102 p refs Presented at the 36th Ann. Meeting of the SBPC (Sociedade Brasileira para o Progresso Ciencia), Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3172-PRE/542) Avail: NTIS HC A06/MF A01

Two computer programs to aid microstrip design are developed. The first uses consultation from a remote terminal, while the other plots graphs. These programs make use of closed form expressions and take into account effects of thickness, metallic enclosure and dispersion. Tables and graphs (obtained with the programs) for RT/DUROID 5880 and 6010 dielectric substracts are presented. Author

N84-31965# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A FAST METHOD FOR COMPUTER IMAGE ENHANCEMENT
P. Muralikrishna Jul. 1984 11 p refs To be presented in the SBPC, 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3170-PRE/540) Avail: NTIS HC A02/MF A01

The conventional method adopted for the contrast enhancement of an m x n pixel image involves m x n multiplications and hence the time required for the enhancement is proportional to the total number of pixels. The number of multiplications required for the enhancement is a function of only the number of gray levels used and hence is much faster than the conventional method. After determining the distribution of the gray level population, the enhancement factor is derived for each of the existing gray levels. The new gray level is the product of the old gray level and the corresponding enhancement factor. The new gray levels thus obtained are stored as dimensioned variables, each having its old gray level as its dimension. When different parts of an image have different types of population distribution, each part is enhanced separately, and in this case the part number is taken as a second dimension, the old gray level being the other dimension. Author

N84-31966*# Intermetrics, Inc., Huntsville, Ala.
REFLIGHT CERTIFICATION SOFTWARE DESIGN SPECIFICATIONS
15 Aug. 1984 143 p
(Contract NAS8-33825)
(NASA-CR-171138; NAS 1.26:171138; IR-AL-032) Avail: NTIS HC A07/MF A01 CSCL 09B

The PDSS/IMC Software Design Specification for the Payload Development Support System (PDSS)/Image Motion Compensator (IMC) is contained. The PDSS/IMC is to be used for checkout and verification of the IMC flight hardware and software by NASA/MSFC. Author

N84-31967# University of Southern California, Marina del Rey. Information Sciences Inst.
IMPLEMENTATION OF INTERLISP ON THE VAX
R. L. Bates, D. Dyer, and J. A. G. M. Koomen May 1984 19 p
(Contract MDA903-81-C-0335)
(AD-A141707; ISI/RS-84-129) Avail: NTIS HC A02/MF A01 CSCL 09/2

Some of the issues involved in implementing Interlisp on a VAX computer with the goal of producing a version that runs under unix, specifically Berkeley VM/UNIX are discussed. Some of the goals of this implementation were to be compatable with and functionally equivalent to Interlisp-10 and to serve as a basis for future Interlisp implementations on other mainframe computers. R.J.F.

N84-31968# Softech, Inc., Waltham, Mass.
Ada (TRADE NAME) ORIENTATION FOR MANAGERS L101 TEACHER'S GUIDE
May 1984 162 p
(Contract DAAB07-83-C-K514)
(AD-A141846) Avail: NTIS HC A08/MF A01 CSCL 05/9

A teacher's guide to a course in the Ada programming language is given. Some transition issues concerning Ada are discussed, as well as the uses of Ada in the future. R.J.F.

N84-31969# Electronics Research Lab., Adelaide (Australia).
A SOFTWARE SCHEME FOR MANAGING MAGNETIC TAPE STORAGE SPACE
J. C. Gwatking and R. W. Collier Aug. 1983 30 p
(AD-A142847; ERL-0285-TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report analyses a problem which has been facing the DRCS central computing facility for a number of years: the continual growth in demand for magnetic tape storage within the computer room. It summaries the various techniques which have been proposed and implemented to reduce the rate of growth and finally describes in detail a software scheme which has alleviated the problem. The basis of the scheme is to categories all tapes as either active or inactive, permitting the latter category to be stored outside the computer room. Author (GRA)

N84-31970# California Univ., Berkeley.
CONTINUATION OF RESEARCH IN COMPUTER SIMULATION OF INTEGRATED CIRCUITS Final Report, 1 Nov. 1980 - 30 Apr. 1984
C. O. Pederson Jun. 1984 7 p
(Contract DAAG29-81-K-0021)
(AD-A143005; ARO-17660.4-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

Research summarized here had as its objective the investigation of emerging problems in integrated circuit simulation, including circuit equation solution, use of circuit and device model library features for hierarchical design, introduction of models for controlled switches and transmission liner to the SPICE2 computer program, and development of hardware aids for circuit simulation. Author (GRA)

N84-31971# Army Construction Engineering Research Lab., Champaign, Ill.
AUTOMATED CONSTRUCTION MANAGEMENT SYSTEM (ACMS). VOLUME 1: USER'S GUIDE
J. S. Young and C. E. Herring, Jr. Jun. 1984 103 p 2 Vol.
(DA Proj. 4A7-62731-AT-41)
(AD-A143031; CERL-TR-P-158-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Automated Construction Management System has been developed to manage the construction projects of Army Engineer units. It is a full-feature project management system implemented on a multiuser microcomputer. The approach taken to develop the system was to exploit commercially available software programs and hardware to minimize programming requirements and allow researchers to devote their resources to application of the system. This user's manual explains how to use the General Applications Module, the Data Base Management Module, the Network Analysis Module, the Weekly Progress Report Module, and the Reports Generation Module. GRA

N84-31972# Army Construction Engineering Research Lab., Champaign, Ill.
AUTOMATED CONSTRUCTION MANAGEMENT SYSTEM (ACMS). VOLUME 2: PROGRAM DOCUMENTATION Final Report
C. E. Herring, Jr. and J. S. Young Jun. 1984 255 p 2 Vol.
(DA Proj. 4A7-62731-AT-41)
(AD-A143032; CERL-TR-P-158-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 09/2

The Automated Construction Management System (ACMS) has been developed to manage Army Engineer unit construction projects. It is a full-feature project management system implemented on a multiuser microcomputer system. The approach in developing the system was to exploit commercial software programs and hardware to minimize programming requirements and thus allow researchers to spend more time finding uses for the system. This volume contains the data base documentation for ACMS version 84.0, including system requirements, installation instructions, and program listings. GRA

N84-31973# Softech, Inc., Waltham, Mass.
INTEGRATED COMPUTER-AIDED MANUFACTURING (ICAM) ARCHITECTURE. PART 3, VOLUME 6: COMPOSITE INFORMATION MODEL OF 'MANUFACTURE PRODUCT' (MFG1) Final Report, Sep. 1980 - Oct. 1982
C. Martin, A. Nowlin, W. St.John, S. Smith, and T. Ruegsegger Wright-Patterson AFB, Ohio AFWAL Sep. 1983 899 p 8 Vol.
(Contract F33615-80-C-5109)
(AD-A143072; Rept-1080-35; AFWAL-TR-82-4063-Vol-6) Avail: NTIS HC A99/MF A01 CSCL 09/2

The Integrated Computer Aided Manufacturing (ICAM) Architecture Part III was initiated to maintain and update the existing manufacturing architecture as well as develop training courses to assist in the transition of IDEF (ICAM definition) applications, concepts and procedures to other Air Force programs. This volume, Volume VI, presents the composite view depicting manufacturing as it exists today in the form of an AS IS Information Model of Manufacturing. Author (GRA)

N84-31974# Dawkins (William P.), Stillwater, Okla.
USER'S GUIDE: COMPUTER PROGRAM FOR ANALYSIS OF TWO-DIMENSIONAL BEAM-COLUMNS WITH NONLINEAR SUPPORTS (CBNTBM) Final Report
W. P. Dawkins Mar. 1984 79 p
(Contract DACW39-81-M-0715)
(AD-A143170; WES-IR-K-84-5) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report documents a computer program--CBNTBM--for analysis of a plane frame structure which is an assemblage of beam-column elements with linear and/or nonlinear spring supports. The report: (1) Describes the structural system considered and the mathematical model used for analysis; (2) Presents the force-displacement relationships for the mathematical model and describes the computational procedure used for solution; (3) Describes the computer program; and (4) Presents example solutions obtained with the program. Author (GRA)

N84-31975# Oak Ridge Associated Universities, Tenn. Assessment and Field Support Program.
GUIDE TO COMPUTER-BASED TRAINING
Jan. 1984 108 p
(Contract DE-AC05-76OR-00033)
(DE84-012244; DOE/OR-00033/T62) Avail: NTIS HC A06/MF A01

Aspects of Computer Based Training (CBT) are discussed. Topics include the role of the computer in training programs, systems evaluation, examination of available hardware and software, acquisition of CBT, and practical experience with CBT systems. M.A.C.

N84-31976# Oak Ridge Y-12 Plant, Tenn. Computer Sciences Div.
USER'S GUIDE TO SPHERE AND PLATE INTERACTIVE DISPLAY ROUTINE (SPIDR)
Z. W. Bell 29 May 1984 104 p
(Contract DE-AC05-84OR-21400)
(DE84-012855; Y/DW-489) Avail: NTIS HC A06/MF A01

An interactive graphics display program capable of producing axonometric views of three-dimensional data is described. The mathematics of the projection transformation is given. Descriptions of the individual program modules are given, and a user's manual is provided. DOE

N84-31977# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
GETTING INTO CAD AT THE SAVANNAH RIVER PLANT
William R. Scoggins 1984 15 p Presented at the Computer-Aided Eng. Symp., Wilmington, Del., 15-17 May 1984
(Contract DE-AC09-76SR-00001)
(DE84-011581; DP-MS-84-40; CONF-8405151-2) Avail: NTIS HC A03/MF A01

In 1978, the Savannah River Plant (SRP) Project Department was producing approximately 1100 new drawings and 3000 revisions per year, with a force of 30 draftsmen. Design services for the Plant were increasing due to changing programs, obsolescent equipment replacements and added security requirements. This increasing workload greatly increased the engineering drafting backlog. At the same time, many draftsmen were approaching retirement age and were to be replaced with unskilled draftsman trainees. A proposal was presented to management to acquire a Computer Aided Drafting (CAD) system to produce instrument and electrical drawings which comprised 30% of the work load. DOE

N84-31978# Institute for Telecommunication Sciences, Boulder, Colo.
NETWORK: A USER ORIENTED, INTERACTIVE, STATION-SITING PROGRAM FOR NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) VHF WEATHER RADIO
G. R. Hand and J. E. Adams Apr. 1984 97 p refs Sponsored in part by National Weather Service
(PB84-202233; NTIA/Rept-84-146) Avail: NTIS HC A05/MF A01 CSCL 09B

NETWORK is an interactive computer program designed to help national weather service (NWS) expand the NOAA Weather Radio Network to obtain the desired coverage at minimum spectrum usage. For each active station, areas of predicted service and co-channel interference are calculated by NETWORK. This manual describes how to use the NETWORK program as well as the propagation prediction methods that it uses. GRA

N84-31979# California Univ., Livermore. Lawrence Livermore Lab. Methods Development Group.
DYNA3D USER'S MANUAL. NONLINEAR DYNAMIC ANALYSIS OF SOLIDS IN THREE DIMENSIONS, REVISION 1
John O. Hallquist Apr. 1984 109 p refs
(Contract W-7405-eng-48)
(DE84-012828; UCID-19592-Rev-1) Avail: NTIS

HC A06/MF A01

An updated user's manual for DYNA3D, an explicit three dimensional finite element code for analyzing the large deformation dynamic response of inelastic solids is provided. A contact impact algorithm permits gaps and sliding along material interfaces. By a specialization of this algorithm, such interfaces can be rigidly tied to admit variable zoning without the need of transition regions. Spatial discretization is achieved by the use of 8 node solid elements, and the equations of motion are integrated by the central difference method. DYNA3D contains fifteen material models and nine equations of state to cover a wide range of material behavior. DOE

N84-31980# Mathematisch Centrum, Amsterdam (Netherlands).
ABSTRACTION, SPECIFICATION AND IMPLEMENTATION TECHNIQUES WITH AN APPLICATION TO GARBAGE COLLECTION Ph.D. Thesis
H. B. M. Jonkers 1983 146 p refs
(MATH-CENTRE-TRACTS-166; B8342321; ISBN-90-6196-263-3) Avail: NTIS HC A07/MF A01

Design of a garbage collector for a machine-independent ALGOL 68 implementation is discussed. Simple mathematical concepts and methods which are applied to the subject of storage management in general and to garbage collector in particular are utilized. Author (ESA)

N84-31981# Centre Technique des Industries Mecaniques, Senlis (France).
SIGNAL ANALYSIS AND DATA PROCESSING SYSTEM (ACOUSTIC AND VIBRATORY) Final Report [SYSTEME D'ANALYSE DES SIGNAUX (ACOUSTIQUE ET VIBRATOIRES) ET DE TRAITEMENT DE DONNEES]
Yves Birembaut Sep. 1982 52 p In FRENCH
(CETIM-11-H-50-9) Avail: NTIS HC A04/MF A01

The utilization of programs for acoustic and vibratory signal acquisition, analysis and processing on HP 9835 and HP 9854 C calculators is outlined. The programs are written in BASIC and are conversational. They link an analyzer, (or recorder) and a calculator to control instruments or store data or are used for file maintenance. Author (ESA)

N84-31982# Centre Technique des Industries Mecaniques, Senlis (France).
INVESTIGATION OF CRITERIA ENABLING A TWO-DIMENSIONAL GRID TO EVOLVE WHILE MINIMIZING ERRORS Final Report [ETUDE DE CRITERES PERMETTANT DE FAIRE EVOLUER UN MAILLAGE BIDIMENSIONNEL EN MINIMISANT L'ERREUR INDUITE]
Cristescu and ElYafi 8 Sep. 1983 51 p In FRENCH
(CETIM-100980) Avail: NTIS HC A04/MF A01

Methods of evolving the interior grid of a two dimensional object of which one side is subjected to known geometrical and mechanical constraints are discussed. The regularity of the initial grid, composed of six-node equilateral triangles should be preserved. The top nodes are the barycenters of the summits to which they are attached. Since only the interior coordinates are unknown, the problem is reduced to the solution of a system of linear equations with a unique solution. Equal coefficients produce the best grid. Author (ESA)

N84-31983# Centre Technique des Industries Mecaniques, St. Etienne (France).
PRELIMINARY INVESTIGATIONS OF MEANS TO TRANSFER COMPUTER PROGRAMS TO THE FORGING INDUSTRY Final Report [ETUDE EXPLORATOIRE DES MOYENS PERMETTANT LE TRANSFERT DE PROGRAMMES INFORMATIQUES A L'INDUSTRIE DE LA FORGE]
J. F. Renaudin Oct. 1982 37 p refs In FRENCH
(CETIM-1.3K.38.2) Avail: NTIS HC A03/MF A01

Use of computer aided design (CAD) in forging is assessed. Costs rule out entire CAD systems, but programs which analyze tooling needs, predict flow properties, analyse stress and predict damage are available. The use of microcomputers is expected to increase CAD techniques in forging. Author (ESA)

N84-31984# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
THE INFLUENCE OF COMPUTER AIDED DESIGN (CAD) ON RESEARCH
W. Loeve and R. F. vandenDam 5 Jun. 1983 17 p refs In DUTCH; ENGLISH summary Presented at Symp. on de Betekenis van CAD/CAM voor de Neder. vliegtuigbouw, Delft, 6 May 1983 (NLR-MP-83026-U) Avail: NTIS HC A02/MF A01

The effects of CAD on cooperation aspects within the National Aerospace Laboratory (NLR) and between NLR and the aircraft industry are discussed. An infrastructure of hardware and software to support the aerodynamic design of aircraft is described. Organizational and technical aspects of this development are described. The CAD techniques make it possible to program NLR knowledge in such a way that it can directly be used for design in the industry by means of a dialogue between computer and designer. Author (ESA)

N84-31985# National Weather Service, Garden City, N.Y.
WARN: A WARNING FORMATTER
G. G. Rigdon Jun. 1984 31 p refs
(PB84-204551; NOAA-NWS-ERCP-21; NOAA-84061108) Avail: NTIS HC A03/MF A01 CSCL 09B

WARN allows a forecaster to put a character in a box next to a county name in a preformat and the program will insert the county names in two places in the proper format for Cable TV. The program also produces the date/time line of the mass media header and places the expiration time in two places. GRA

N84-31986# United Nations Industrial Development Organization, Vienna (Austria).
GUIDELINES FOR SOFTWARE PRODUCTION IN DEVELOPED COUNTRIES
Hermann Kopetz 10 Feb. 1984 109 p refs
(PB84-202795; UNIDO/IS.440; V-84-81528) Avail: NTIS HC A06/MF A01 CSCL 09B

The following topics are discussed: (1) definition of software; the role of software and hardware in the computer industry, (2) the need for self help and a software policy in DCs; organizational aspects, training centers, standards; (3) organizing a software project; (4) the software development process; (5) a standard operating system for microcomputers; and (6) a methodology for structured systems analysis and functional systems design. GRA

N84-31987# National Geodetic Survey, Rockville, Md.
HEART OF GOLD: COMPUTER ROUTINES FOR LARGE SPARSE, LEAST SQUARES COMPUTATIONS
D. G. Milbert Apr. 1984 35 p refs
(PB84-196492; NOAA-TM-NOS-NGS-39; NOAA-84052201) Avail: NTIS HC A03/MF A01 CSCL 09B

A collection of routines for processing large, sparse, least squares systems is described. The routines are highly transportable and support structural development of programs. GRA

N84-31122# Softech, Inc., Waltham, Mass.
THE EVOLUTION OF THE JOVIAL/J73 LANGUAGE FROM DEFINITION TO USE
J. T. Pepe *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 3-9 (For primary document see N84-31121 21-06)
(AD-P003518) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31123# Proprietary Software, Inc., Los Angeles, Calif.
MANAGEMENT OVERVIEW OF THE BENEFITS OF EFFICIENT JOVIAL J73/1750A SOFTWARE TOOLS
J. Fleiss *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 15-18 (For primary document see N84-31121 21-06)
(AD-P003519) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31125# General Research Corp., Santa Barbara, Calif.
J73AVS: A JOVIAL J73 AUTOMATED VERIFICATION SYSTEM
C. Gannon *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 65-84 (For primary document see N84-31121 21-06)
(AD-P003521) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31126# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
JOVIAL LANGUAGE CONTROL PROCEDURES WITH A VIEW TOWARD Ada (TRADEMARK)
P. A. Knoop and B. R. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 49-63 (For primary document see N84-31121 21-06)
(AD-P003522) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31127# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FEASIBILITY ASSESSMENT OF JOVIAL TO Ada (TRADEMARK) TRANSLATION
D. H. Ehrenfried *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 65-84 (For primary document see N84-31121 21-06)
(AD-P003523) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31135# Army Communications-Electronics Command, Fort Monmouth, N.J.
THE NEBULA AND MCF (MILITARY COMPUTER FAMILY) STANDARDIZATION PROGRAMS
E. Lieblein *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 177-185 (For primary document see N84-31121 21-06)
(AD-P003531) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31137# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
TRANSPORTABILITY OF NEBULA SOFTWARE
G. L. Steele, Jr. *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 207-217 (For primary document see N84-31121 21-06)
(AD-P003533) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31138# RCA Government Systems Div., Moorestown, N. J. Missile and Surface Radar.
THE IMPACT OF NEBULA, MCF (MILITARY COMPUTER FAMILY), AND Ada (TRADEMARK) ON REAL-TIME EMBEDDED COMPUTER SYSTEMS
F. E. Wuebker *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 219-224 (For primary document see N84-31121 21-06)
(AD-P003534) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31139# Raytheon Co., Sudbury, Mass. Equipment Div.
PAS/NEB: A PASCAL LANGUAGE TOOL FOR THE MCF (MILITARY COMPUTER FAMILY)
E. Souren, G. Lonardo, and R. Couranz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 225-237 (For primary document see N84-31121 21-06)
(AD-P003535) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31140# Sperry Univac, St. Paul, Minn.
A PROGRAMMABLE BUS CONTROL INTERFACE
R. M. Salter *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 241-254 (For primary document see N84-31121 21-06)
(AD-P003536) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31159# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
MIL-STD-1750A VERIFICATION TESTING
L. E. Velez *In its* Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 493-499 (For primary document see N84-31121 21-06)
(AD-P003555) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31160# RCA Government Systems Div., Moorestown, N. J. Missile and Surface Radar.
Ada (TRADEMARK) AS A PROGRAM DESIGN LANGUAGE. A RATIONAL APPROACH TO TRANSITIONING INDUSTRY TO THE WORLD OF Ada THROUGH A PROGRAM DESIGN LANGUAGE CRITERIA
R. M. Blasewitz *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 509-513 (For primary document see N84-31121 21-06)
(AD-P003556) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31161# Naval Ocean Systems Center, San Diego, Calif.
THE KAPSE (KERNEL Ada (TRADEMARK) PROGRAMMING SUPPORT ENVIRONMENT) INTERFACE TEAM
P. A. Oberndorf *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 519-532 (For primary document see N84-31121 21-06)
(AD-P003557) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31162# Sperry Univac, St. Paul, Minn. Defense Systems Div.
THE Ada (TRADEMARK) RUN-TIME ENVIRONMENT
J. K. Cross *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 533-538 (For primary document see N84-31121 21-06)
(AD-P003558) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31163# Marconi Avionics Ltd., Boreham Wood (England).
A CODE OF PRACTICE TO CONSTRAIN Ada (TRADEMARK)
T. G. Swann *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 541-542 (For primary document see N84-31121 21-06)
(AD-P003559) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31164# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CONSIDERATIONS
C. L. Braun *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 545-559 (For primary document see N84-31121 21-06)
(Contract DAAK80-81-C-0187)
(AD-P003560) Avail: NTIS HC A25/MF A01 CSCL 05/9

N84-31187# Arinc Research Corp., Annapolis, Md.
STANDARD AVIONICS SOFTWARE: THE FUTURE STRATEGY FOR COST-EFFECTIVE AVIONICS
E. C. Straub *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 927-945 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003582) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31193# Technology Development of California, Arlington, Tex.
SYSTEM PLANNING TOOL TO MEASURE COST AVOIDANCE RESULTING FROM INDEPENDENT ASSESSMENT TECHNIQUES APPLIED TO TEST PROGRAM SOFTWARE DEVELOPMENT
P. D. Kidd *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1017-1028 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003588) Avail: NTIS HC A25/MF A01 CSCL 12/1

N84-31194# Boeing Aerospace Co., Seattle, Wash.
A CORPORATE APPROACH TO AN EMBEDDED SOFTWARE DEVELOPMENT AND SUPPORT STANDARD
D. D. Doe, D. E. Hilt, G. B. Wigle, J. P. Bateman, and L. L. Tripp *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1029-1041 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003589) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31195# Rome Air Development Center, Griffiss AFB, N.Y.
MIL-STD DEFENSE SYSTEM SOFTWARE DEVELOPMENT
D. F. Bergstrom *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2, Nov. 1982 p 1043-1052 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003590) Avail: NTIS HC A25/MF A01 CSCL 09/2

N84-31196# Department of the Air Force, Washington, D.C.
COST/SCHEDULE MANAGEMENT FOR SOFTWARE DEVELOPMENT
H. Wendt and M. W. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1053-1069 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003591) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31197# Department of the Air Force, Washington, D.C.
SOFTWARE CONFIGURATION MANAGEMENT IN A PROJECT ENVIRONMENT
H. Wendt and M. W. Evans *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1071-1082 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003592) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-31200# Proprietary Software Systems, Inc., Beverly Hills, Calif.
PLANNING OF OPERATIONAL SOFTWARE IMPLEMENTATION TOOL
A. Spinak *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1115-1131 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003595) Avail: NTIS HC A25/MF A01 CSCL 05/1
see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32237# Hazeltine Corp., McLean, Va.
AN ADAPTIVE CBT (COMPUTER BASED TRAINING) COURSEWARE AUTHORING SYSTEM TO MEET THE NEEDS OF MILITARY AUTHORS
D. Mudrick and D. Stone *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 105-108 (For primary document see N84-32223 21-81)
(AD-P003460) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32238# Grumman Aerospace Corp., Bethpage, N.Y.
USER FRIENDLY AUTHORING LANGUAGES: AN ALTERNATIVE APPROACH
C. R. Myers, Jr. and R. A. Schaefer *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 109-114 (For primary document see N84-32223 21-81)
(AD-P003461) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32247# Naval Training Equipment Center, Orlando, Fla.
REAL-TIME CGSI (COMPUTER GENERATED SYNTHESIZED IMAGERY)-SINGLE PIPELINE PROCESSOR
D. M. Baldwin, B. F. Goldiez (Dept. of the Army, Orlando, Fla.), C. P. Graf (Honeywell, Inc., Minneapolis, Minn.), and T. W. Dillingham (Honeywell, Inc., West Covina, Calif.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 243-252 (For primary document see N84-32223 21-81)
(AD-P003480) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32254# Boeing Military Airplane Development, Wichita, Kans.
SOFTWARE DOCUMENTATION SUPPORT
K. M. Atchinson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 300-304 (For primary document see N84-32223 21-81)
(AD-P003487) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32255# AAI Corp., Cockeysville, Md.
SOFTWARE PROGRESS TRACKING SYSTEM
T. M. Moriarity *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 305-311 (For primary document see N84-32223 21-81)
(AD-P003488) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32256# Essex Corp., Alexandria, Va.
USER-FRIENDLY SOFTWARE: THE ROLE OF THE USER
E. Callahan *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 312-319 (For primary document see N84-32223 21-81)
(AD-P003489) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32264# AAI Corp., Baltimore, Md.
AUTOMATED SOFTWARE TESTING
R. Spital *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 367-370 (For primary document see N84-32223 21-81)
(AD-P003498) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32077# Joint Publications Research Service, Arlington, Va.
STABLE METHOD FOR SOLVING LINEAR PROGRAMMING PROBLEM WITH APPROXIMATE DATA Abstract Only
A. N. Tikhonov, A. A. Ryutin, and G. M. Agayan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 132 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Oct. 1983 p 1058-1063 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32078# Joint Publications Research Service, Arlington, Va.
TWO-PHASE METHODS OF SOLVING CANONICAL PROBLEM OF LINEAR PROGRAMMING Abstract Only
R. Gabasov, F. M. Kirillova, O. I. Kostyukova, and A. A. Senko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 132 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (Minsk), v. 27, no. 9, Sep. 1983 p 787-790 (For primary document

62 COMPUTER SYSTEMS

Includes computer networks.

N84-31988*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MODEL OF ASYNCHRONOUS ITERATIVE ALGORITHMS FOR SOLVING LARGE, SPARSE, LINEAR SYSTEMS
Daniel A. Reed (North Carolina Univ., Chapel Hill) and Merrell L. Patrick (Duke Univ.) Jul. 1984 29 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172418; ICASE-84-34; NAS 1.26:172418) Avail: NTIS HC A03/MF A01 CSCL 09B

Solving large, sparse, linear systems of equations is one of the fundamental problems in large scale scientific and engineering computation. A model of a general class of asynchronous, iterative solution methods for linear systems is developed. In the model, the system is solved by creating several cooperating tasks that each compute a portion of the solution vector. This model is then analyzed to determine the expected intertask data transfer and task computational complexity as functions of the number of tasks. Based on the analysis, recommendations for task partitioning are made. These recommendations are a function of the sparseness of the linear system, its structure (i.e., randomly sparse or banded), and dimension. B.W.

N84-31989# Hanford Engineering Development Lab., Richland, Wash.
FUNDAMENTALS OF COMPUTER SECURITY
F. M. Berting 4 Apr. 1984 6 p refs Presented at the 7th Intern. Conf. of Women Engr. and Sci., Washington, D.C., 17-24 Jun. 1984
(Contract DE-AC06-76FF-02170)
(DE84-011476; HEDL-SA-3128-FP; CONF-8406118-1) Avail: NTIS HC A02/MF A01

Computer systems manages must address the need for protecting important company information and programs used to process that information by computers. Not related to the government classified category, this data is anything that could cause loss or harm to the company if altered, destroyed, or divulged. Threats specific to computer systems, such as unauthorized access to, or improper use of such data must be addressed without spending more on protective measures than is risked. Procedures are available to estimate such risks. Actions of people pose far greater threats than fire, flood or major disasters. Protective measures, therefore, emphasize preventing people from doing harm, accidentally or maliciously, by keeping out the unauthorized, tracking the activities of the authorized, and maintaining back up copies of everything required for essential company operations. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-31990# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE COPYCAT PROJECT: AN EXPERIMENT IN NONDETERMINISM AND CREATIVE ANALOGIES
D. R. Hofstadter (Indiana Univ., Bloomington) Jan. 1984 49 p
(Contract N00014-80-C-0505)
(AD-A142744; AI-M-755) Avail: NTIS HC A03/MF A01 CSCL 06/4

A micro-world is described, in which many analogies involving strikingly different concepts and levels of subtlety can be made. The question What differentiates the good ones from the bad ones? is discussed, and then the problem of how to implement a computational model of the human ability to come up with such analogies (and to have a sense for their quality) is considered. A key part of the proposed system, now under development, is its dependence on statistically emergent properties of stochastically interacting codelets (small pieces of ready-to-run code created by the system, and selected at random to run with probability proportional to heuristically assigned urgencies). Another key element is a network of linked concepts of varying levels of semanticity, in which activation spreads and indirectly controls the urgencies of new codelets. There is pressure in the system toward maximizing the degree of semanticity or intensionality of descriptions of structures, but many such pressures, often conflicting, must interact with one another, and compromises must be made. GRA

N84-31991# Centre Technique des Industries Mecaniques, St. Etienne (France).
STUDY OF NUMERICAL CONTROL SYSTEMS FOR MACHINES. INTEGRATION IN FLEXIBLE WORKSHOPS AND UNITS Final Report [ETUDE DES SYSTEMES DE COMMANDE NUMERIQUE DE MACHINES. INTEGRATION DANS LES ATELIERS ET CELLULES FLEXIBLES]
P. Pontier Feb. 1984 56 p In FRENCH
(CETIM-1.3T.042) Avail: NTIS HC A04/MF A01

The numerical control market was surveyed and trends in the use of microcomputers to control simple and complex systems were assessed. Computer aided manufacturing is becoming more widespread for overseeing machining, maintenance, tooling and interfacing system elements. Increased modularity reduces costs to users since systems can be bought according to needs rather than being tailor made. Author (ESA)

N84-31743# California Univ., Santa Barbara. Dept. of Geography.
APPLYING ARTIFICIAL INTELLIGENCE TO LARGE NETWORKS
Terence R. Smith, Jeffrey L. Star, Principal Investigators, and Ralph Dubayah *In its* Activities of the Remote Sensing Inform. Sci. Res. Group 1 May 1984 4 p ERTS (For primary document see N84-31739 21-43)
Avail: NTIS HC A07/MF A01 CSCL 09B

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-31992*# Illinois Univ., Chicago. Dept. of Electrical Engineering.
PROBABILITY OF UNDETECTED ERROR AFTER DECODING FOR A CONCATENATED CODING SCHEME
Daniel J. Costello, Jr. and Shu Lin (Hawaii Univ., Manoa) 23 Jul. 1984 25 p refs
(Grant NAG5-234)
(NASA-CR-173837; NAS 1.26:173837) Avail: NTIS HC A02/MF A01 CSCL 12A

A concatenated coding scheme for error control in data communications is analyzed. In this scheme, the inner code is used for both error correction and detection, however the outer code is used only for error detection. A retransmission is requested if the outer code detects the presence of errors after the inner code decoding. Probability of undetected error is derived and bounded. A particular example, proposed for NASA telecommand system is analyzed. Author

N84-31993*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLUX-VECTOR SPLITTING AND RUNGE-KUTTA METHODS FOR THE EULER EQUATIONS Final Report
Eli Turkel and Bram vanLeer Jun. 1984 12 p refs
(Contracts NAS1-16394; NAS1-17070; NAS1-17130)
(NASA-CR-172415; ICASE-84-27; NAS 1.26:172415) Avail: NTIS HC A02/MF A01 CSCL 12A

Runge-Kutta schemes have been used as a method of solving the Euler equations exterior to an airfoil. In the past this has been coupled with central differences and an artificial vesocity in space. In this study the Runge-Kutta time-stepping scheme is coupled with an upwinded space approximation based on flux-vector splitting. Several acceleration techniques are also considered including a local time step, residual smoothing and multigrid. B.W.

N84-31994# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE SURFACE GENERATION USING WEIGHTED SPLINES [GERACAO DE SUPERFICIES LIVRES FOR MEIO DE SPLINES PONDERADOS]
Jose Antonio Goncalves Pereira and Nandamudi Lankalapalli Vijaykumar Jun. 1984 7 p In PORTUGUESE; ENGLISH summary Presented at the 50th Congr. Brasileiro de Automatica/10th Congr. Latino-Am. de Automatica, a Realizar-se, Campina Grande, Brazil, 3-6 Sep. 1984
(INPE-3160-PRE/534) Avail: NTIS HC A02/MF A01

The surface generating method proposed by Coons is used extensively in designing automobile bodies, ship bulls and other complex forms which are impossible to analytically describe. In order to describe the cages which basically provide these surfaces, B Spline methods are traditionally used. But these have a disadvantage as the control points do not belong to the generated curves and this creates difficulties in modifying the design. A

method for generating the cages, known as Weighted Splines possesses great computational efficiency but without the restriction of the control points. In this method the control points belong to the generated curves. M.A.C.

N84-31995# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STATE ESTIMATION AND PARAMETER IDENTIFICATION: AN APPROACH INVOLVING A PAIR CONSISTING OF THE INITIAL STATE AND THE TRAJECTORY
Jose Antonio M. Felippe deSouza Jul. 1984 8 p refs Presented at the 1st Latin-American Conf. on Automatic Control and the 5th Brazilian Conf. on Automatic Control, Campina Grande, Brazil, 3-6 Sep. 1984
(INPE-3183-PRE/548) Avail: NTIS HC A02/MF A01

The problem of state estimation as well as the joint problem of state estimation and parameter identification of nonlinear distributed parameter systems (e.g., systems described by partial differential equations) were studied. An original approach involving a pair (z(sub o),z(.)) consisting of the initial state z(sub o) and the trajectory z(.), this pair will lie in a space M which is the cross-product Z x X between the state space Z (which will be assumed to be a Banach space) and a space of trajectories X (e.g., X=L2(0,T;Z) or X=C(0,T;Z) for some T > 0). In this setting, some mappings F : M yields M are constructed and the solution of the problem of state estimation as well as the joint problem of state and parameter estimation are obtained via the fixed points of such F's. Fixed points have been used in control and estimation (for nonlinear evolution systems). Author

N84-31996# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPENSATING TECHNIQUE USING ONE ACTIVE CONTROL SCHEME TO NULLIFY THE ACUMMULATED EFFECT OF MODELLING DEVIATION [TECNICAS DE COMPENSACAO UTILIZANDO UM ESQUEMA DE CONTROLE ATIVO PARA ANULAR O EFEITO ACUMULADO DO DESVIO DA MODELAGEM]
Decio Castilho Ceballos and Atair Rios Neto Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/50th Congr. Brasileiro de Automatica - 10 CLA/50 CBA, Campina Grande, 3-6 Sep. 1984
(INPE-3181-PRE/546) Avail: NTIS HC A02/MF A01

A procedure which acts globally in the filter and controller in a way to compensate the restricted fidelity in modelling is presented. The basic ideal of this procedure is to nullify the accumulated effect of the deviation in the modelling by using a correction in the contol, such as to induce the physical system to have a behavior close to the model of work used in the synthesis and implementation of the control. This effect is estimated using the concept of divergence in the filter of the state estimator. The procedure was applied to the attitude control of one of the axes of a satellite with flexible appendages whose physical model was approximated by a 14th order time invariant linear dynamic system. For the filter and controller synthesis a working model of order two was used corresponding to the rigid body motion. The results obtained were excellent both in absolute sense and in comparison with other procedures. Author

N84-31997# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SMOOTHING ON THE FREQUENCY DOMAIN [SUAVIZACAO NO DOMINIO DA FREQUENCIA]
Roberto Vieira daFonseca Lopes Jul. 1984 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Latino-Am. de Automatica/50th Congr. Brasileiro de Automatica - 10 CLA/50 CBA, Campina Grande, 3-6 Sep. 1984
(INPE-3182-PRE/547) Avail: NTIS HC A02/MF A01

A suboptimal solution is constructed for periodic data smoothing, characterized by few coefficients when compared with a spline solution. A nonperiodic smoother for continuous measurements, that is closely related with a Butterworth filter is also developed. An application example with N equally spaced data shows the saving in number of coefficients obtained without decay of performance. The order of smoothing that specifies the shape of the solution can be modified with no change in the structure of the equations, on both developed procedures. M.A.C.

N84-31998# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TUTORIAL: FUZZY SETS AND APPLICATIONS [TUTORIAL: CONJUNTOS NEBULOSOS E APLICACOES]
Orion deOliveira Silva and Celso deRenna e Souza Jul. 1984 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 50th Congr. Brasileiro de Automatica/10th Congr. Latino-Am. de Automatica, a Realizar-Se, Campina Grande, 3-6 Sep. 1984
(INPE-3168-PRE/538) Avail: NTIS HC A02/MF A01

The Theory of Fuzzy sets is examined including entropic measures, fuzzy function minimization and applications of fuzzy sets. The presentation is uniform with examples, applications and comments, and some results obtained in the study of decision rule induction problems are presented, as well as some applications. A technique for fuzzy function minimization is also presented. M.A.C.

N84-31999# Wisconsin Univ., Madison. Center for Mathematics Research.
ASYMPTOTIC ESTIMATES FOR RESOLVENTS OF SOME NON-INTEGRABLE VOLTERRA KERNELS
S. O. Londen Mar. 1984 44 p
(Contract DAAG29-80-C-0041)
(AD-A141662; MRC-TSR-2654) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let A be an element of (loc)L(1(R+), A is not an element of L(1)(R+), a(t)=b(t)c(t), 0<t<infinity, where b(t) is completely monotone and c(t) is of positive type. Thus b(t)= the integral(R+) e(-st)d mu(s), and c(t)= the integral limited as T approaches infinity(T,0) (1-s/t)cost(st)dv(s) where mu(s) and v(s) are nondecreasing functions, defined on R+, locally of bounded variation. The resolvent r of a is the solution for t > or 0 of r(t)+(r*a)(t) =a(t). Extend v to R- as odd and let (') denote Fourier transforms. Then a'(z)=1/2 integral (R) b'(z-ix)dv(x) for Re z sufficiently large. Using this formula conditions are given on mu and v which imply that R' is locally sufficiently smooth to satisfy r is an element of L(1)(R+). These conditions are shown to differ depending on the size of b at infinity. M.G.

N84-32000# Wisconsin Univ., Madison. Center for Mathematics Research.
DIRECTIONAL CONVEXITY AND FINITE OPTIMALITY CONDITIONS
A. Bressan Mar. 1984 18 p
(Contract DAAG29-80-C-0041)
(AD-A141698; MRC-TSR-2664) Avail: NTIS HC A02/MF A01 CSCL 12/1

For Lambda contained as a subclass within R(D), one can say that a set A contained in R(D) is Lambda-convex if the segment pq is contained in A whenever p, q is a member of A and p-q is a member of Lambda. For the control system dot-x(t)=G(x(t)) x u(t), x(o)=0 is a member of R(d), u(t) is a member of Omega which is contained in R(m) for every t Omega [0,T], assuming that the reachable set R(m) is Lambda-convex, an extension of the Pontryagin Maximum Principle is proved. If x(bar-u,T) lies on the boundary R(T), conditions on the first order tangent cone at x(bar-u,T) can be combined with restrictions, placed on finite difference vectors of the form y-x(bar-u,T), with y being a member of R(T), y-x(bar-u,T) being a member of Lambda. This result is complicated by conditions insuring the directional convexity of the reachable set. They are proven by means of a generalized Mountain Pass Theorem. M.G.

N84-32001# Wisconsin Univ., Madison. Mathematics Research Center.
BAYESIAN MODELS FOR RESPONSE SURFACES, 2: ESTIMATING THE RESPONSE SURFACE Summary Report
D. M. Steinberg Apr. 1984 66 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142768; MRC-TSR-2683) Avail: NTIS HC A04/MF A01 CSCL 12/1

We analyze a Bayesian model for response surfaces. This model augments a simple graduating function with a bias term that represents the difference between the true, but unknown, response function and the graduating function. The model is a straightforward extension of Blight and Ott's (1975) Bayesian model for polynomial regression. The bias term is defined in terms of prior distributions and we show how estimates of the response surface and measures of precision depend on the form of the prior distribution. Estimates and measures of precision are given for strictly proper prior distributions and also when improper priors are assigned to the coefficients of the graduating function, in which case the model leads to generalized spline estimates.

Author (GRA)

N84-32002# Wisconsin Univ., Madison. Mathematics Research Center.

FINITE DIMENSIONAL COMPENSATORS FOR INFINITE DIMENSIONAL SYSTEMS WITH UNBOUNDED CONTROL ACTION Technical Summary Report

R. F. Curtain and D. Salamon May 1984 45 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142808; AD-E401119; MRC-TSR-2684) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper contains a design procedure for constructing finite dimensional compensators for a class of infinite dimensional systems with unbounded input operators. Applications to retarded functional differential systems with delays in the input or the output variable and to partial differential equations with boundary input operators are discussed. Author (GRA)

N84-32003# Wisconsin Univ., Madison. Mathematics Research Center.

BAYESIAN MODELS FOR RESPONSE SURFACES. 1: THE EQUIVALENCE OF SEVERAL MODELS AND THEIR RELATIONSHIP TO SMOOTHING SPLINES Technical Summary Report

D. M. Steinberg Apr. 1984 43 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142843; MRC-TSR-2682) Avail: NTIS HC A03/MF A01 CSCL 12/1

In response surface modeling, simple graduating functions such as low-degree polynomials are used to approximate complex, unknown response functions. Several authors have suggested Bayesian generalizations of response surface models that incorporate prior belief as to the adequacy of a graduating function to represent a response function. The author shows that the models of Smith (1973), Blight and Ott (1975), and O'Hagan (1978) are equivalent statements. It is also showing how their models are related to the generalized smoothing splines of Wahba (1978) and to Young's (1977) proposal for Bayesian polynomial regression. Finally, the author suggests a canonical representation of the models in terms of generalized Fourier series expansions of the response function and shows how such expansions can be used to develop reasonable prior distributions. Author (GRA)

N84-32004# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE CONTROLLED APPROXIMATION ORDER FROM CERTAIN SPACES OF SMOOTH BIVARIATE SPLINES Technical Summary Report

R. Q. Jia May 1984 26 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142868; MRC-TSR-2696) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report continues the study of approximation by bivariate smooth splines on a three-direction mesh. Initiated by de Boor, DeVore and Hollig, box splines have proved useful in determining the approximation order from certain spaces of bivariate splines. By using box splines, de Boor and Hollig gave a sharp upper bound for the approximation order, and Jia got a sharp lower bound for it. But there is still a gap between these two bounds. While determining the exact value of the approximation order is still a formidable problem, Dahmen and Micchelli consider the so-called controlled approximation order from certain spaces of bivariate splines. In their study, Dahmen and Micchelli use a characterization result of Strang and Fix concerning controlled approximation. However, the result of Strang and Fix has been shown to be not true in their original sense. After adjusting the definition of controlled approximation order suitably, in another report, the author obtains the desired characterization property for controlled approximation by box splines. Hereafter he shall refer to controlled approximation in the latter sense. This report determines completely the controlled approximation order from the span of all box splines of any given order and smoothness. GRA

N84-32005# Wisconsin Univ., Madison. Mathematics Research Center.

STATISTICAL INFERENCE FOR RELIABILITY FROM STRESS STRENGTH RELATIONSHIPS: THE NORMAL CASE Technical Summary Report

B. Reiser and I. Guttman May 1984 26 p
(Contract DAAG29-80-C-0041)
(AD-A142893; MRC-TSR-2695) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper examines statistical inference for $P(Y < X)$, where X and Y are independent normal variates with unknown means and variances. The case of unequal variances is stressed. X can be interpreted as the strength of a component subjected to a stress Y, and $P(Y < X)$ is the components reliability. For point estimation, a predictive estimator which can be calculated from the Behrens-Fisher distribution is derived and compared with the maximum likelihood and uniformly minimum variance unbiased estimators through a simulation study. Two approximate methods for obtaining confidence intervals and an approximate Bayesian probability interval is obtained. The actual coverage probabilities of these intervals is examined by simulation. Author (GRA)

N84-32006# Wisconsin Univ., Madison.

CONVERGENCE OF BIVARIATE CARDINAL INTERPOLATION Technical Summary Report

C. D. Boor, K. Hoellig, and S. Riemenschneider May 1984 21 p
(Contract DAAG29-80-C-0041)
(AD-A142894; MRC-TSR-2686) Avail: NTIS HC A02/MF A01 CSCL 12/1

This is a follow-up on a previous report in which the authors introduced and studied interpolation by a linear combination of translates of a bivariate box spline on a three-direction mesh. This is of interest because these box splines are not just tensor products of univariate B-splines but are genuinely bivariate, yet are true generalizations of the univariate cardinal B-spline. This allows one to be guided by Schoenberg's highly successful analysis of univariate cardinal splines, while at the same time struggling with a more complicated setup. The specific task of the present report is the derivation of necessary and of sufficient conditions for the convergence of the box spline interpolants as the degree goes to infinity. The conditions are stated in terms of the Fourier transform of the interpolant. GRA

N84-32007# Wisconsin Univ., Madison. Mathematics Research Center.

WEIGHTED INEQUALITIES AND DEGENERATE ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS Technical Summary Report

E. W. Stredulinsky May 1984 226 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142895; MRC-TSR-2691) Avail: NTIS HC A11/MF A01 CSCL 12/1

Various weighted inequalities and weighted function spaces relevant to degenerate partial differential equations are studied. The results are applied to degenerate second order divergence form elliptic equations and systems to establish continuity of weak solutions. The methods used allow the consideration of very general classes of weights. In particular the weights are characterized for

several Sobolev inequalities in terms of weighted capacities, a theorem is proven for weighted reverse Holder inequalities and a continuity estimate is established for certain weighted Sobolev spaces. Author (GRA)

N84-32008# Wisconsin Univ., Madison. Mathematics Research Center.
EFFICIENT SEQUENTIAL DESIGNS WITH BINARY DATA Technical Summary Report
C. F. J. Wu May 1984 41 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0154)
(AD-A142904; MRC-TSR-2692) Avail: NTIS HC A03/MF A01 CSCL 12/1

A class of sequential designs for estimating the percentiles of a quantal response curve is proposed. Its updating rule is based on an efficient summary of all the data available via a parametric model. The logit-MLE version of the proposed designs can be viewed as a natural analogue of the Robbins-Monro procedure in the case of binary data. It is shown to be asymptotically consistent, distribution-free and optimal via its connection with the latter procedure. For certain choices of initial designs the proposed method performs very well in a simulation study for sample sizes up to 35. A nonparametric sequential design, via the Spearman-Kerber estimator, for estimating the median is also proposed. Author (GRA)

N84-32009# Wisconsin Univ., Madison. Mathematics Research Center.
GLOBALLY CONVERGENT PROCEDURES FOR SOLVING NONLINEAR MINIMIZATION PROBLEMS Technical Summary Report
A. Eydeland May 1984 31 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142905; MRC-TSR-2699) Avail: NTIS HC A03/MF A01 CSCL 12/1

The method developed in this paper applies to a number of nonlinear minimization problems. The bibliography includes the numerical implementation for several applied problems. The main advantages of the author's approach are: generally of the technique, global convergence of the method, its ease of formulation and implementation, and its numerical efficiency. The method can be extended to variational problems. GRA

N84-32010# Wisconsin Univ., Madison. Mathematics Research Center.
SPLINE APPROXIMATION FOR RETARDED SYSTEMS AND THE RICATTI EQUATION Technical Summary Report
F. Kappel (Graz Univ.) and D. Salamon Apr. 1984 111 p
Sponsored in part by Bremen Univ. and Foererung der Wissenschaftlichen Forshung, Austria
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A142963; MRC-TSR-2680) Avail: NTIS HC A06/MF A01 CSCL 12/1

The purpose of this paper is to introduce a new spline approximation scheme for retarded functional differential equations. The special feature of this approximation scheme is that it preserves the product space structure of retarded systems and approximates the adjoint semigroup in a strong sense. These facts guarantee the convergence of the solution operators to the differential Riccati equation in a strong sense. Numerical findings indicate a significant improvement in the convergence behavior over both the averaging and the previous spline approximation scheme. Furthermore, controllability and observability criteria are given for the approximating systems, which are shown to be stable respectively stabilizable for sufficiently large N provided that the underlying retarded system has the same property. Author (GRA)

N84-32011# Wisconsin Univ., Madison. Mathematics Research Center.
THE ARITHMETIC OF DIFFERENTIATION Technical Summary Report
L. B. Rall May 1984 33 p
(Contract DAAG29-80-C-0041)
(AD-A142964; MRC-TSR-2688) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report describes automatic differentiation, which is neither symbolic nor approximate, for single functions of one real variable. The rules of evaluation and differentiation are combined into an ordered-pair arithmetic similar to complex arithmetic, but slightly simpler. Evaluation of the formula for a function in this arithmetic yields both the values of the function and its derivative, without a formula for the derivative of the function, and without numerical approximation, since this arithmetic is based on the well-known rules for differentiation. The properties of this arithmetic are examined, and illustrated by simple examples. Subroutines are given for differentiation arithmetic both on a hand-held programmable calculator, and in the microcomputer language PASCAL-SC. An application of this arithmetic to the solution of equations by Newton's method is given, using a PASCAL-SC program. Author (GRA)

N84-32012# Princeton Univ., N. J. Dept. of Statistics.
BI- AND POLY-OPTIMAL CONFIDENCE LIMITS FOR A LOCATION AND PARAMETER
S. Morgenthaler Nov. 1983 66 p
(Contract DAAG29-82-K-0178)
(AD-A142980; TR-254-SER-2; ARO-19442.15-MA) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this report we define poly-optimal confidence intervals for a location-parameter. The formulas are given for the case of two shapes, but can easily be extended to the case of many shapes. For the case of two situations, the Gaussian and the slash, the resulting family of confidence interval estimators is examined. These interval estimators are competitors of existing so-called robust procedures. A comparison to a few of these is included. Author (GRA)

N84-32013# Aeronautical Research Associates of Princeton, Inc., N. J.
RESEARCH IN NONLINEAR MOTION Final Report, 1 May 1981 - 30 Apr. 1984
H. Segur 30 Jun. 1984 11 p
(Contract DAAG29-81-C-0009)
(AD-A143000) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research done under this contract can be described in terms of two guiding questions: Where is the boundary between integrable and nonintegrable problems?; and What are the consequences of a problem's being on one side or the other of this boundary? Author (GRA)

N84-32014# Wisconsin Univ., Madison. Mathematics Research Center.
ASSESSMENT OF LOCAL INFLUENCE Technical Summary Report
R. D. Cook May 1984 34 p
(Contract DAAG29-80-C-0041)
(AD-A143002; MRC-TSR-2694) Avail: NTIS HC A03/MF A01 CSCL 12/1

The statistical analysis of a collection of data is usually based on a specified model, a mathematical formula describing the behavior of the data up to a few unknown parameters which are to be estimated from the data. The specification of a model often involves making assumptions that may have little prior support. In such situations it becomes necessary to understand if important results of an analysis are strongly dependent on the validity of assumptions underlying the model. The purpose of this paper is to provide a method for assessing the influence of minor model perturbations on the results of an analysis. GRA

N84-32015# North Carolina Univ., Chapel Hill. Operations Research and Systems Analysis.
AN EXHAUSTIVE ANALYSIS OF MULTIPLICATIVE CONGRUENTIAL RANDOM NUMBER GENERATORS WITH MODULUS 2(31)-1
G. S. Fishman and L. R. Moore, III Jun. 1984 49 p
(Contract N00014-76-C-0302)

(AD-A143085; UNC/ORSA/TR-84/5) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents the results of an exhaustive search to find optimal full period multipliers for the multiplicative congruential random number generator with prime modulus 2 to the 31st power -1. Here a multiplier is said to be optimal if the distance between adjacent parallel hyperplanes on which k-tuples lie does not exceed the minimal achievable distance by more than 25 percent for k=2,...,6. This criterion is considerably more stringent than prevailing standards of acceptability and leads to a total of only 414 multipliers among the more than 534 million candidate multipliers. Section 1 reviews the basic properties of linear congruential generators and Section 2 describes worst case performance measures. These include the maximal distance between adjacent parallel hyperplanes, the minimal number of parallel hyperplanes, the minimal distance between k-tuples, the lattice ratio and the discrepancy. Section 3 presents the five best multipliers and compares their performance with those of three commonly employed multipliers for all measures but the lattice test. Comparisons using packing measures in the space of k-tuples and in the dual space are also made. Section 4 presents the results of applying a battery of statistical tests to the best five to detect local departures from randomness. None were found. The Appendix contains a list of all optimal multipliers. Author (GRA)

N84-32016# Maryland Univ., College Park. Inst. for Physical Science and Technology.
FUNDAMENTAL RESEARCH IN APPLIED MATHEMATICS Final Report, 1 Jan. 1977 - 29 Feb. 1984
F. W. J. Olver 12 Jun. 1984 12 p
(Contract DAAG29-80-C-0032; Grant DAAG29-77-G-0003)
(AD-A143123; ARO-14044.9-MA; ARO-16928.8-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Problems were studied and solved in five main areas: asymptotic solutions of second-order differential equations; numerical solution of difference equations; algorithms for the generation of mathematical functions; error analysis of numerical algorithms; computer arithmetic. Author (GRA)

N84-32017# Yale Univ., New Haven, Conn. Dept. of Computer Science.
PLTMGC: A MULTI-GRID CONTINUATION PROGRAM FOR PARAMETERIZED NONLINEAR ELLIPTIC SYSTEMS
R. E. Bank and T. F. Chan Dec. 1983 31 p refs
(Contract DE-AC02-81ER-10996)
(DE84-010406; YALEU/DCS/RR-261) Avail: NTIS HC A03/MF A01

PLTMGC is a program package for solving nonlinear elliptic systems that have explicit dependence on a scalar parameter. In addition to being able to compute solutions for fixed parameter values, it can be used to solve the linear eigenvalue problem, trace solution branches, accurately locate singular points (simple turning points and bifurcation points) and switch branch at simple bifurcation points. A multigrid continuation approach is employed in which a continuation procedure is used to follow the solution curve on the coarsest grid and a multigrid algorithm is used to refine the solution at selected points using an adaptive mesh refinement strategy. Some numerical examples illustrating the performance of the package are given. DOE

N84-32018# Mathematisch Centrum, Amsterdam (Netherlands).
MULTIPLE GRID METHODS FOR EQUATIONS OF THE SECOND KIND WITH APPLICATIONS IN FLUID MECHANICS Ph.D. Thesis
H. Schippers 1983 21148 p refs
(MATH-CENTRE-TRACTS-163; B8402121; ISBN-90-6196-260-9)
Avail: NTIS HC A07/MF A01

Multiple grid methods for solving the algebraic systems that occur in numerical methods for the Fredholm equations of the second kind were studied. Iterative schemes of Brakkage's and Atkinson's method were extended. Multiple grid methods can be utilized in the programming language ALGOL 68 and in fluid mechanics. Potential flow around airfoils and oscillating disk flow were considered. Author (ESA)

N84-32019# Mathematisch Centrum, Amsterdam (Netherlands).
UPPER BOUNDS FOR THE NUMBERS OF SOLUTIONS OF DIOPHANTINE EQUATIONS Ph.D. Thesis
J. H. Evertse 1983 144 p refs
(MATH-CENTRE-TRACTS-168; B84345066; ISBN-90-6196-265-X)
Avail: NTIS HC A07/MF A01

A diophantine equation of the form F(x,y) = m (Thue's equation) where F is an homogeneous polynomial of degree n in two variables which is irreducible a non-zero integer was studied. Upper bounds for the number of solutions are given. Thue's and Siegel's method were generalized. Parry's result was improved. Results on diophantine equations which are reducible to a finite number of Thue and Thue-Mahler equations were proved. Author (ESA)

N84-31279*# Seattle Univ., Wash.
EXPONENTIAL-FITTED METHODS FOR INTEGRATING STIFF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS: APPLICATIONS TO HOMOGENEOUS GAS-PHASE CHEMICAL KINETICS
David T. Pratt *In* APL Computational Methods. 1984 JPM Spec. Session Feb. 1984 p 53-68 refs (For primary document see N84-31276 21-20)
(Grant NAG3-227)
Avail: NTIS HC A05/MF A01 CSCL 12A

N84-32079# Joint Publications Research Service, Arlington, Va.
ECONOMICAL MULTIPLICATION OF BOOLEAN EQUATIONS Abstract Only
Yu. I. Zhuraviev and N. M. Platonenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 133 Transl. into ENGLISH from Zh. Vychislitelnoy Mat. i Mat. Fiz. (Moscow), v. 24, no. 1, Jan. 1984 p 164-166 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32080# Joint Publications Research Service, Arlington, Va.
SEQUENTIAL METHOD OF MINIMIZING NONLINEAR FUNCTION ON SIMPLEX Abstract Only
V. S. Mikhalevich and N. N. Redkovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 133 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 3, Jan. 1984 p 544-547 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-32020# Naval Postgraduate School, Monterey, Calif.
SOURCES OF ERROR IN OBJECTIVE ANALYSIS Interim Report, Oct. 1983 - Mar. 1984
R. Franke May 1984 54 p
(AD-A142772; NPS53-84-0003) Avail: NTIS HC A04/MF A01 CSCL 12/1

The error in objective analysis methods that are based on corrections to a first guess field is considered. An expression that gives a decomposition of the error into three independent components is derived. To test the magnitudes of the contribution of each component a series of computer simulations was conducted. Grid-to-observation point interpolation schemes considered ranged from simple piecewise linear functions to highly accurate spline functions. The observation-to-grid interpolation methods considered included most of those in present meteorological use, such as optimum interpolation and successive corrections, as well as proposed schemes such as thin plate splines, and several variations of these schemes. The results include an analysis of cost versus skill; this information is summarized in plots for most

combinations. The degradation in performance due to inexact parameter specification in statistical observation-to-grid interpolation schemes is addressed. The efficacy of the mean squared error estimates in this situation is also explored. Author (GRA)

N84-32021# Princeton Univ., N. J. Dept. of Statistics.
STRONG CONFIDENCE INTERVALS: A COMPROMISE BETWEEN THE GAUSSIAN AND THE SLASH
S. Morgenthaler Nov. 1983 55 p
(Contract DAAG29-82-K-0178)
(AD-A142981; TR-253-SER-2; ARO-19442.14-MA) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this report we define strong confidence interval procedures and discuss their properties. Strong confidence means that the reported confidence level is achieved even conditioned on configurations. Furthermore this is true for both the Gaussian and the slash sampling situations. We will show how such a procedure can be obtained and compare its performance to some popular non-parametric confidence intervals. Author (GRA)

N84-32022# Princeton Univ., N. J. Dept. of Statistics.
THE USE OF DOUBLE SAMPLING IN STUDYING ROBUSTNESS
S. Morgenthaler and J. Tukey Sep. 1983 18 p
(Contracts DAAG29-82-K-0178; DE-AC02-81ER-10841)
(AD-A142982; TR-252-Ser-2; ARO-19442.13-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report deals with an application of double sampling in the area of robustness. Configural polysampling is a technique which allows a detailed comparison of existing estimator and helps in finding small-sample-optimal estimators. The technique involves sampling across configurations. The associated sampling error can be reduced by using double sampling. Formulas for doing this are given and demonstrated in an example. Author (GRA)

N84-32023# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
WEIBULL ANALYSIS HANDBOOK Final Technical Report, 1 Jul. 1982 - 31 Aug. 1983
R. B. Abernethy, J. E. Breneman, C. H. Medlin, and G. L. Reinman Wright-Patterson AFB, Ohio AFWAL Nov. 1983 243 p
(Contract F33615-82-C-2242)
(AD-A143100; PWA/GPD-FR-17579; AFWAL-TR-83-2079) Avail: NTIS HC A11/MF A01 CSCL 12/1

This handbook is intended to provide instructions on how to do Weibull analysis. It will provide an understanding of Weibull analysis that is common between the military and industry. The handbook contains seven chapters plus an appendix. The chapters are written containing a minimum of mathematics with proofs given in the appendix. Author (GRA)

N84-32024# Princeton Univ., N. J. Dept. of Statistics.
VARIANCE-STABLE R-ESTIMATORS
E. Ronchetti and J. H. Yen May 1984 15 p
(Contract DAAG29-82-K-0178)
(AD-A143172; TR-266-SER-2; ARO-19442.20-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

By means of the concept of change-of variance function we investigate the stability properties of the asymptotic variance of R-estimators. This allows us to construct the optimal V-robust R-estimator that minimizes the asymptotic variance at the model, under the side condition of a bounded change-of variance function. Finally, we discuss the connection between this function and an influence function for two-sample rank tests introduced by Eplett (1980). Author (GRA)

N84-32025# Mathematisch Centrum, Amsterdam (Netherlands).
ON POINT PROCESSES Thesis
P. C. T. vanderHoeven 1983 21143 p refs Sponsored by Netherlands Organization for the Advancement of Pure Research (ZWO) and CNRS, Paris
(MATH-CENTRE-TRACTS-165; B8342320; ISBN-90-6196-262-5) Avail: NTIS HC A07/MF A01

Probability mechanisms according to which a locally finite subset of a locally compact space U with countable base is chosen (point processes) were studied. Probability distribution of this locally finite subset of this finite or countable set of points is discussed. Palm's distribution was reconsidered and other opposite ways were explored. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-32026 International Inst. for Applied Systems Analysis, Laxenburg (Austria).
[ACTIVITIES IN APPLIED SYSTEMS ANALYSIS] Annual Report, 1983
1984 68 p refs
Copyright. Avail: Issuing Activity

Systems analysis research in economics, environment effects, energy consumption, decision making, population, food, and science and technology is summarized. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-32027 Suomalainen Tiedeakatemia, Helsinki (Finland).
HYPERHARMONIC CONES AND HYPERHARMONIC MORPHISMS Thesis
Sirkka-Liisa Eriksson 1984 79 p refs Sponsored in part by Academy of Finland, the Heikki and Hilma Honkanen Foundation, the Alfred Kordelin Foundation, and the Vilho, Yrjoe and Kalle Vaeisaelae Foundation
(ISBN-951-41-0476-5; ISSN-0355-0087) Copyright. Avail: Issuing Activity

A hyperharmonic cone is defined taking some properties of positive hyperharmonic functions as axioms. An example of hyperharmonic cones is the cone of hyperharmonic functions on a harmonic space. Hyperharmonic cones are compared with hyperharmonic structures and the properties of cancellable elements are studied. Cancellable elements of hyperharmonic cones form an H-cone and coincide with cancellable elements with respect to the specific order. Properties of the specific order in hyperharmonic cones are examined and it is proved that hyperharmonic cones are complete lattices with respect to the specific order. Moreover, the greatest specific lower bound and the least specific upper bound are translation-invariant. Hyperharmonic cones satisfy also the Riesz decomposition property. The definition of an H-morphism is extended to the hyperharmonic case. An interposition theorem is proved for hyperharmonic morphisms. It is also shown that in certain cases hyperharmonic morphisms form a hyperharmonic cone. Finally, it is proved that every hyperharmonic cone is isomorphic to the subcone of positive continuous numerical functions on a locally compact space. Using this result it is shown that also every H-cone is isomorphic to the subcone of positive continuous numerical functions, which are finite on a dense set. M.G.

N84-32028# Mathematisch Centrum, Amsterdam (Netherlands).
NONNEGATIVE MATRICES IN DYNAMIC PROGRAMMING Ph.D. Thesis
W. H. M. Zijm 1983 202 p refs Revised
(MATH-CENTRE-TRACTS-167; B8342322; ISBN-90-6196-264-1) Avail: NTIS HC A10/MF A01

The asymptotic behavior of dynamic programming recursion (quasi-linear equations), based on a set K of negative square matrices with the product property was studied. Convergence results are established. A proof of Scweizzer's and Federgruen's method (geometric convergence in discontinued Markov decision processes) is presented. Applications to Markov chains with

countable state space and strong ergodicity and the Doeblin condition are discussed. Author (ESA)

N84-32029# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON THE UNIQUENESS OF A REGULAR THIN NEAR OCTAGON ON 288 VERTICES (OR THE SEMIBIPLANE BELONGING TO THE MATHIEU GROUP M12)
A. E. Brouwer Jul. 1983 15 p refs
(MC-ZW-196/83; B8467324) Avail: NTIS HC A02/MF A01

Partial lambda-geometries of semi-symmetric design SSD(v,k, lambda) are considered. Conditions on the group of automorphisms are removed. A semi-symmetric design SSD(v,k,lambda) is defined as a connected incidence structure with v points and v blocks where blocks have size k and there are k blocks on a point while any two different blocks have 0 or lambda points in common, and any two distinct points on 0 or lambda blocks. Semi-biplane is defined as SSD(v,k,2). Partial lambda-geometry is an SSD(v,k, lambda) such that for any nonincident pair (p,B), where p is a point and B a block, there are precisely e (number of nexus) blocks meeting B. A semi-biplane with $k = 5$ is unique and semibiplane with $k = 10$ was proved not to exist. Hanani's condition for semibiplanes with $k = 6$ was rediscovered. Unique stabilization of a block in the semibiplane with $k = 12$ in the automorphism of Leonard was proved. Semibiplanes with $k = 20$ are studied by consideration of the other cases. Author (ESA)

N84-32030# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
SOME OBSERVATIONS CONCERNING THE ZERO-CURVES OF THE REAL AND IMAGINARY PARTS OF RIEMANN'S ZETA FUNCTION
J. vandeLune Dec. 1983 29 p refs
(MC-ZW-201/83) Avail: NTIS HC A03/MF A01

The extent to which the zero-curves of the real part of Riemann's zeta function penetrate the half plane of complex numbers was considered. Exceptions to Gram's law and Rosser's rule are discussed along with the Lehmer effect. Author (ESA)

N84-32031# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
AN INFINITE SERIES OF SYMMETRIC DESIGNS
A. E. Brouwer Dec. 1983 9 p refs
(MC-ZW-202/83; B8467327) Avail: NTIS HC A02/MF A01

Semisymetric design SSD(v,k,lambda) with $v = 2$ (q sup h, + q sup h - 1... + q) + 1 and $k = q$ sup h and lambda = 1/2 q sup h - 1 (q - 1) whenever q is an odd prime power and $h > 0$ or $= 1$, is considered. Partial 2-geometry SSD(v,k,lambda) was studied. Open problems on symetric design with small index are proposed. Author (ESA)

N84-32032# Bielefeld Univ. (West Germany). Zentrum fuer Interdisziplinaere Forschung.
APPLICATIONS OF THE MALLIAVIN CALCULUS, PART 2
S. Kusuoka and D. Stroock (Colorado Univ., Boulder) Jun. 1984 117 p refs
(Contract NSF MCS-83-10542)
(Rept-83-Pt-2) Avail: NTIS HC A06/MF A01

The basic machinery needed to study regularity properties of uniformly elliptic ITO porcesses by means of Malliavin's calculus is discussed. The Markovian setting is interpreted via Malliavin's covariance matrix. Microlocalization theory is developed. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-32033 Duke Univ., Durham, N. C.
THE NONLINEAR DYNAMICS OF SPINNING PARABOLOIDAL ANTENNAS Ph.D. Thesis
William Lee Shoemaker 1983 188 p
Avail: Univ. Microfilms Order No. DA8405295

A method of systematically generating the discrete nonlinear equations of dynamics up to and including third degree nonlinearities for spinning paraboloidal antennas is presented. The antennas considered are thin shells such that Kirchoff assumptions are valid and are of linearly elastic material with properties which are symmetric with respect to the tangent plane of the middle surface. The spinning motion, which may be a function of time and about an axis which may or may not coincide the the axis of revolution of the antenna, alters the stiffness and damping characteristics through centrifugal and Coriolis effects. The middle surface may have imperfections and the antenna may be subjected to any conservative loading. The deformations may be nonaxisymmetric and they may be large enough to produce geometric nonlinearities. Dissert. Abstr.

N84-32034# Tokyo Denki Univ. (Japan).
RESEARCH REPORTS OF THE FACULTY OF ENGINEERING, NO. 31
Dec. 1983 140 p refs In ENGLISH and JAPANESE
(DEC/1983/31; ISSN-0389-617X) Avail: NTIS HC A07/MF A01

The following topics are addressed herein: reaction motors in steady state operation, oxygen glow discharges, nerve membrane dynamics, the photo-darkening effect of AgBr films, liquid crystal phases, UV absorption spectra of z-pyrid ones, silicon-based amorphous films, and shearing stress of a concrete wall. For individual titles, see N84-32035 through N84-32042.

N84-32035# Tokyo Denki Univ. (Japan).
STEADY STATE PERFORMANCE OF SINGLE-PHASE REACTION MOTOR c33
Hitoshi Ishiyama, Kunihiko Karube, and Naokichi Isobe *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 1-16 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

A single-phase reaction motor is a small machine which is to obtain synchronous speed. It consists of two-phase stator windings and squirrel cage rotor windings similar to a single-phase induction motor. The reaction motor has a series condenser which is connected to the auxiliary winding to obtain starting torque, and has a saliency on the rotor to be driven at synchronous speed. Current and torque properties of the reaction motor are described at synchronous speed, asynchronous speed, and at standstill by solving the voltage equation of stator and rotor windings. The current and torque show reasonably close agreement with the experimental results. Author

N84-32036# Tokyo Denki Univ. (Japan). Dept. of Electronic Engineering.
ION-MOLECULE REACTIONS AND PLASMA PARAMETERS OF POSITIVE COLUMN IN OXYGEN GLOW DISCHARGE c75
T. Kaneda, Y. Ichikawa (Wright State Univ.), R. I. C. Wu (Wright State Univ.), and T. O. Tiernan (Wright State Univ.) *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 17-28 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

Oxygen glow discharge plasmas have many applications, such as oxidations of polymers, semiconductors, and photoresist removal. The physical characteristics of this discharges depend on the plasma parameters which are much influenced by many reactions in discharge tubes. The oxygen glow dischages are investigated theoretically by taking account of the many reactions in discharge tubes. The calculated values of plasma parameters such as electron temperature, axial electric field, and relative concentrations of charged particles of oxygen glow discharges were obtained. Furthermore, in order to compare these theoretical values with experimental results, the electron temperature and axial electric field were studied by the probe method and the relative concentrations of charged particles were measured by mass spectrometer. It is shown that the calculated results of electron temperature and axial electric field of oxygen flow

discharges agree well with these experimental ones. The calculated results of the relative concentrations of charged particles also agree with the measured values by mass spectrometer. Author

N84-32037# Tokyo Denki Univ. (Japan). Dept. of Electronic Engineering.
NONLINEAR DYNAMICS IN EXCITABLE NERVE MEMBRANES c52
Kazuyuki Aihara, Makoto Kotani, Hirokazu Noguchi, and Takashi Numaziri *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 29-34 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

Nonlinear oscillations in excitable nerve membranes are theoretically analyzed by the Hodgkin-Huxley ordinary and partial differential equations. The formation of self-sustained oscillation in nerve membranes is described by a subcritical inverted Hopf bifurcation in the nonliner neutral dynamics. It is also reported that the nonlinear dynamics produces chaotic oscillations and different bifurcating routes into chaos. Author

N84-32038# Tokyo Denki Univ. (Japan).
EFFECT OF THERMAL IRRADIATION FROM EVAPORATION SOURCE TO PHOTO-DARKENING SENSITIVITY OF VACUUM DEPOSITED AgBr FILM c35
Yoichi Abe *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 35-42 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

Evaporated films from the AgBr-SnO2 mixture previously showed photochromic properties: darkened by ultraviolet (UV) irradiation and bleached by heating. However, AgBr film showed no photochromic property, and its photo-darkening sensitivity was less than that of AgBr-SnO2 films. The photo-darkening effect of vacuum deposited AgBr films is shown to be greately sensitized by thermal irradiation from the evaporation source. The degree of such sensitization effect is affected by the rise of substrate temperature during evaporation, and not affected to any significant degree by the absolute value of substrate temperature. When the substrate temperatures rises above 1 C, the value of optical density of these films darkened by UV irradiation reaches 1.8. Author

N84-32039# Tokyo Denki Univ. (Japan).
PROPERTIES OF BUBBLE DOMAINS IN CHOLESTERIC-NEMATIC MIXTURES c76
Chikao Obayashi *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 43-50 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

Some results of observation on the bubble domain texture found in a homeotropically aligned texture of large pitch cholesterics are reported. Transformation from the nematic homeotropic phase to the bubble domain tecture was observed in a narrow range of pitch and cell thickness combination. Bubble domains were generated either by electrohydrodynamic turbulence in a cholesterics of negative dielectric anisotopy, or by thermal turbulence in a mixture with positive dielectric anisotropy. The electrical properties of bubble domains depend on the dielectric anisotropy of the cholesteric mixture used. In a cholesterics with negative dielectric anisotropy involving small amount of dielectrically positive nematics, bubble domains are controlable with only a dc electric field in regard to generation and erasure. Author

N84-32040# Tokyo Denki Univ. (Japan).
HYDROGEN-BOND ENERGIES OF DIMER FORMATION AND UV ABSORPTION SPECTRA OF MONO-METHYL SUBSTITUTED 2-PYRIDONES c25
Akira Fujimoto and Kozo Inuzuka *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 51-62 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

The dimer formations of mono-methyl substituted 2-pyridones were studied by infrared (IR) and ultraviolet (UV) spectral methods. The hydrogen bond energies of the dimer formations of these compounds were examined by the IR spectral method and were calculated by the complete neglect of differential overlap (CNDO)/2 method, and the equilibrium constant was obtained in carbon tetrachloride by means of the UV and IR spectral methods. Moreover, the transition energies and oscillator strengths of monomer and dimer were calculated by the CNDO/CI method. The calculated results were compared with the UV absorption spectral data of the methyl-substituted 2-pyridones. Author

N84-32041# Tokyo Denki Univ. (Japan).
IMPROVEMENT IN QUALITY OF SILICON-BASED AMORPHOUS FILMS c76
K. Ebara, T. Homma, Y. Fukami, Y. Kobayashi, Y. Abe, and T. Aono *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 63-92 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

Amorphous Si, Si sub 1-xGe sub x, and Si sub 1-x N sub x films were prepared by RF glow discharge method and their electrical and optical properties were investigated as a function of x. A growth model of a-Si film was proposed on the basis of the reaction of plasma species on the substrate. For the purpose of improving the film quality, two preparation methods were employed. One was that dc or ac bias voltage was superimposed on the RF plasma through the substrate holder and screen electrode, and the other was that bias current applied along the film surface during its growth. A significant improvement was obtained in the photoconductivity of films by using these methods. The mechanism of such increase in photoconductivity is discussed in terms of the homogeneity of film and the reduction of film damage due to the bombardment of plasma particles of high energy. The optical bandgap of a-Si sub 1-x Ge sub x was controlled in the range of 1.1 to 1.78 eV with a germanium content and that of a-Si sub 1-x N sub x was in the range of 1.75 to 2.0 eV with a nitrogen content. In addition, applications of those materials to the development of high efficient a-Si solar cells and photoconductive target of image pick-up tubes were also studied. Author

N84-32042# Tokyo Denki Univ. (Japan).
CONSIDERATIONS ON DEFORMABLE ABILITY AND ULTIMATE STRENGTH OF ASEISMIC WALLS. PART 2: ABOUT THE DERIVATION OF A FORMULA ON ULTIMATE SHEARING STRESS OF WALLS AND ITS APPLIED VERIFICATION FOR SOME EXPERIMENTAL RESULTS c39
Fukuzo Suto *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 93-114 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

A method of calculations is considered for an ultimate mean shearing stress of a precast concrete wall (containing site-placing concrete wall) connected by several steel gusset-plates with its surrounding beams and columns. The method formulates an expression for a mean shearing stress flowing from beam to wall by means of equalizing collapse stresses of concrete or steal to principal stresses located in three representative places such as two wall corners and center of beam-wall line. The resultant values calculated applying the the expression to several cases for wall models of actual experiments carried out previously are compared with experimental data. They are in good agreement, mutually showing the appropriation of the expression presented herein for the ultimate mean shearing stress glowing into walls. Author

N84-32043# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS
9 Jul. 1984 156 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UPM-84-003) Avail: NTIS HC A08/MF A01

Various topics relating to physics and mathematics are discussed. Ultrasonics, acoustics, semiconductor materials, fluid dynamics, nuclear physics, plasma physics, and thermodynamics are among the topics discussed. For individual titles, see N84-32044 through N84-32080.

N84-32044# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF ACOUSTIC PROPERTIES OF SOUND ABSORBING FIBROUS MATERIALS ON THEIR STRUCTURE Abstract Only **c71**
N. N. Voronina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 8 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 5, Sep. - Oct. 1983 p 598-602 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The performance of sound absorbing structures is characterized by two acoustic parameters: the dimensionless wave impedance (referred to the wave impedance of air) and the propagation constant. Both parameters can be defined as complex quantities whose real and imaginary parts were evaluated for various materials. On the basis of experimental data, semiempirical relations were established describing these parameters as functions of the density and of the fiber thickness, in the case of fibrous materials, as well as their frequency characteristics. The results given in pertain to fiberglass, mineral cotton wool, and nylon fiber.
R.J.F.

N84-32045# Joint Publications Research Service, Arlington, Va.
PARAMETRIC EXCITATION OF TRANSVERSE ACOUSTIC SLOT WAVES IN SOLIDS BY MEANS OF MICROWAVE ELECTRIC FIELD Abstract Only **c71**
T. I. Bondarenko and G. N. Burlak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 9 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 132-134 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

It is demonstrated theoretically that a high-frequency electric field can produce transverse acoustic waves propagating along the boundary between two electrostrictive crystals. When the frequency (Omega) of these acoustic waves approaches the pumping frequency (Omega p) of the electric field, parametric resonance of oppositely propagating waves occurs at their frequency and at the difference frequency 2 Omega p-Omega. Resonance of surface acoustic waves differs from resonance of volume acoustic waves, on account of the different interaction dynamics and different boundary conditions. The phenomenon is analyzed here for two identical crystals with cubic symmetry, continguous except for a slot between them, and an electric field parallel to the surface. The corresponding Maxwell equations and elasticity equations, including electrostriction, are formulated in a system of coordinates coinciding with the system of crystallographic axes. These equations, with coefficients varying periodically in time, reduce to an infinite system of coupling equations. This system yields the spectral components and then the dispersion equation. Solution of the latter, by a numerical method, revealed a transmission window in the spectrum within the range of parametric instability. This result can be useful for producing controllable filters.
R.J.F.

N84-32046# Joint Publications Research Service, Arlington, Va.
SIMULATION OF VIBRATORY PROCESSES IN DAMPED STRUCTURES WITH TEMPERATURE-FREQUENCY CHARACTERISTICS OF VIBRATION ABSORBING MATERIALS TAKEN INTO ACCOUNT Abstract Only **c39**
L. Ye. Buvaylo and A. V. Ionov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 12 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 18-22 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A model is constructed which describes vibratory processes in structures with proportional damping on the basis of classical relations for prototype-to model scale-down, these rations being extended here to include both temperature dependence and frequency dependence of the absorption characteristics of the material. These characteristics are defined in terms of the complex modulus of elasticity $E^* = E(1 + j(\text{Beta})_E)$ and the complex modulus of shear $G^* = G(1 + j\text{zG})$ with respective loss coefficients Beta_E and z sub G. The model is further extended to multilayer structures, specifically double-layer structures consisting of a beam with vibration absorbing cladding and tripple-layer 'sandwiches' consisting of a filler between two reinforcing sheaths. The components of the resultant modulus of rigidity of such composite structures are plotted as functions of temperature and frequency in a three-ddimensional system of coordinates. Typical diagrams are shown for structures with Agat as cladding (vibration absorbing) material and for symmetric structures with polyvinyl acetate as viscoelastic filler material, model experiments having been scaled to the 0-30 C temperature range and the 3-3000 Hz frequency range. Some permissible model error were taken into account.
R.J.F.

N84-32047# Joint Publications Research Service, Arlington, Va.
RELATION BETWEEN PRESSURE PULSE GENERATED IN OPTOACOUSTIC RECEIVER AND INTENSITY OF STIMULATING LASER PULSE Abstract Only **c36**
Yu. N. Ponomarev, S. B. Ponomareva, and B. A. Tikhomirov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 13-14 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 26, no. 11, Nov. 1983 p 8-11 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An analysis is made of the time behavior and amplitude of the acoustic signal generated in the cell of an optoacoustic spectrometer upon nonlinear unsteady absorption of a laser pulse by the gas being studied, and an expression is derived for the parameter characterizing nonlinearity of absorption. A solution is found for the equation that describes the pressure pulse that arises when a molecular gas in a closed cell of an optoacoustic receiver absorbs the energy of an incident light pulse, assuming that the energy of the laser radiation is uniformly distributed over the cross section of the beam, that the beam radius is much less than the radius of the receiver, that the length of the cell is much greater than the radius of the receiver, that the pressures in the investigated gas are high enough to disregard losses of vibrational energy upon collisions between excited molecules and the walls of the cell and losses due to spontaneous emission from the excited vibrational state, that the light pulse is square-wave in shape, and that its duration is greater than the time of rotational relaxation in the gas, but much less than the times of vibrational-translational and thermal relaxations.
R.J.F.

N84-32048# Joint Publications Research Service, Arlington, Va.
SOUND FIELD OF TURBULENT WAKE Abstract Only **c71**
L. M. Lamshev and A. T. Skvortsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 15 Transl. into ENGLISH from Pisma Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 24, 26 Dec. 1983 p 1506-1510 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An examination is made of turbulent fluid motion that arises behind a solid in a homogeneous flow at constant velocity much less than the speed of sound in the fluid. Turbulent movement in the wake, like any unsteady motion of a compressible fluid, will be accompanied by acoustic emission. At any predetermined velocity, the intensity of this emission is determined solely by the drag of the solid, and is not explicitly dependent on viscosity, shape of the solid, dimensions of the wake or other factors. The pressure in the sound wave emitted by the wake is found by using Lighthill's relations for generation of sound by a turbulent flow. It is assumed that pulsations are correlated in the turbulent region where emission arises. An expression is derived for the energy emitted by this region per unit of time in all directions. It is shown that acoustic emission of the wake is maximum in the direction of flow, and zero in the direction perpendicular to the flow.
Author

N84-32049# Joint Publications Research Service, Arlington, Va.
NONLINEAR SCATTERING OF RADIO WAVES BY METAL OBJECTS Abstract Only **c32**
V. B. Shteynshleyger *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 17-18 Transl. into ENGLISH from Uspekhi Fiz. Nauk (Moscow), v. 142, no. 1, Jan. 1984

p 131-145 (For primary document see N84-32043 21-70) .
Avail: NTIS HC A08/MF A01

Nonlinear scattering of radio waves by metal structures with resulting harmonic and intermodulation interference is analyzed from both theoretical and empirical standpoints, disregarding nonlinear effects associated with the nonlinear dependence of the electric or magnetic polarization vector on respectively the electric or magnetic field intensity in the wave propagating medium. Nonlinear characteristics of metal-oxide-metal contacts where the thin oxide film separation two metal surfaces has properties approximately those of a dielectric or a high-resistivity semiconductor are discussed. Tunneling was found to be the principal mechanism of charge carrier transfer through such a contact with a sufficiently thin film, the contact having usually a cubic or sometimes an integral sign current-voltage characteristic at 300 K and usually S-form or sometimes a cubic current-voltage characteristic at 77 K. R.J.F.

N84-32050# Joint Publications Research Service, Arlington, Va.
AMPLIFICATION OF TRAVELING MAGNETOSTATIC WAVES BY PARAMETRIC PUMPING Abstract Only **c76**
A. V. Bashkovskiy, V. I. Zubkov, I. V. Krutsenko, and G. A. Melkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 21-22 Transl. into ENGLISH from Pisma Zh. Eksperim. Teoreticheskoy Fiz. (Moscow), v. 39, no. 3, 19 Feb. 1984 p 124-126 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An experiment was performed with traveling surface magnetostatic waves in a structure consisting of two parallel microstrip lines isolated from one another on a common Polycor base, both covered with a YIG (yttrium-iron garnet) film on a GGG (gallium-gadolinum garnet) substrate. An open dielectric pumping cavity resonator at the center of the 9.6 micron thick YIG film on its substrate side was operating in the parallel mode, with its magnetic field parallel to the constant external magnetic field, this mode of operation requiring less power than the transverse mode. The frequency of surface magneto-static waves on the YIG film (saturation magnetization 4 pi m sub o = 1750 Gs, width of resonance line 2 delta H= 0.5 Oe) was approx 4.7 GHz and the pumping frequency was approx. 9.4 GHz, with the intensity of the external magnetic field approx. 940 Oe. Heating of the film was avoided by pumping with pulses of 20 micro sec duration at a repetition rate of 50 Hz rather than with a continuous wave. This experiment for the first time revealed amplification of surface magnetostatic waves, the gain reaching 16 dB at a pumping powr of 2.2 W with 8 MHz bandwidth and 3 micro sec. delay time. Amplification occurred in a magnetic field of intensity H0 corresponding to maximum signal transmission from input to output microstrip line. B.W.

N84-32051# Joint Publications Research Service, Arlington, Va.
CALCULATING ELECTRIC FIELDS IN SEMICONDUCTOR STRUCTURES WHEN SINGULARITIES ARE PRESENT Abstract Only **c76**
V. L. Kulchitskiy, V. P. Plakhotnyy, A. K. Smovzh, and S. V. Svechnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 23-24 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. A Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 12, Dec. 1983 p 39-41 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Since numerical methods such as finite differences encounter serious difficulties when applied to the mathematical simulation of electric fields in various semiconductor structures with singularities at corner points and boundary condition discontinuities, the precise quantitative analysis of such fields must be based on the analysis of the nature of the singularities as a function of structure geometry and the physical parameters of the inhomogeneity. This paper is a theoretical treatment of the electric field in the photoconductive layer of a distributed photoresist structure, where a periodic system of electrodes is applied on top of the layer. Boundary condition discontinuities of the second kind are present at the edges of the electrodes; the electric field at these points has singularities which manifest in the local heating of the material of the photoconductive layer in the regions near the contacts. An analytical solution of the resulting boundary value problem using Laplace equations is used to plot the field distribution of the steady-state electric current in the photoconducting layer as a function of the structure's geometry. B.W.

N84-32052# Joint Publications Research Service, Arlington, Va.
ELECTRICAL CHARACTERISTICS OF METAL-DIELECTRIC-SEMICONDUCTOR SYSTEMS PRODUCED ON EPITAXIAL SILICON STRUCTURES WITH VARIOUS DIELECTRICS Abstract Only **c76**
O. F. Fomicheva, La. A. Otavina, A. M. Sverdlova, and G. G. Kapshtal *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 29 Transl. into ENGLISH from Poverkhnost: Fiz., Khim., Mekhan. (Moscow), no. 1, Jan. 1984 p 80-83 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An experimental study was made of MDS systems with silicon as semiconductor, for the purpose of determining the dependence of their electrical characteristics on the dielectric material. Epitaxial 10 micron thick films of n-Si with electrical resistivity RHO approx 0.8-1 ohm cm were grown on p-Si substrates with resistivity RHO = 10 oh.cm, and the field electrode with a surface area of 0.44 sq mm. In one experiment, three dielectric materials were used: SiO2 produced by thermal oxidation, SiO2 produced by anodic oxidation, and Dy2O3. Both material and deposition process determined the surface condition and the thickness of the space charge reagion as well as the carrier concentration in it. Switching from high-resistance state to low-resistance state was stable and repeatable in each case. While the total low resistance of the MDS device was within 10 to the 2nd power to 10 to the 3rd power ohm and almost independent of the dielectric material, the leakage current in the high-resistance state was highest through thermal SiO2 (10 to the 4th power to 10 to the 5th power ohm, switching voltage 7 V) and lowest through anodic SiO2 (10 to the 7th power ohm, switching voltage 18-23 V) with dy2O3 in the intermediate range. Current-voltage characteristics were measured at frequencies from 20 Hz to 20 kHz with direct current and at the test signal frequency of 0.465 MHz. B.W.

N84-32053# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF BRAGG REFLECTION OF ELECTROMAGNETIC SURFACE WAVES BY DIFFRACTION GRATING Abstract Only **c32**
K. O. Boltar, G. N. Zhizhin, A. A. Sigarev, R. A. Suris, and V. A. Fedirko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 43 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 24, 26 Dec. 1983 p 1502-1506 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Wide-band spectra of conversion of electromagnetic surface waves by diffraction gratings on a metal surface usually show a number of abrupt dips due to Bragg surface wave reflection by the periodic structure of the gratings. In this paper, the authors study the way that the shape and width of a dip in the spectrum of a grating converter of surface electromagnetic waves depend on the grating parameters and conditions of excitation. The spectrum of an electromagnetic surface wave propagating over an inhomogeneous metal surface can be obtained by diagonalizing the inverse propagator of the wave equation G(-)=G sub zero (-1) - V, where G sub zero is the propagator for the smooth metal surface, inhomogeneities. Taking V is a small parameter, perturbation theory is used in the two-wave approximation with consideration of only the interaction of the electromagnetic surface wave with opposite directions of the wave vector. The expressions derived for the shape and width of dips in the spectrum are confirmed by experimental data. Author

N84-32054# Joint Publications Research Service, Arlington, Va.
STABILITY OF STATIONARY ROTATION OF CYLINDER FILLED WITH STRATIFIED VISCOUS INCOMPRESSIBLE FLUID Abstract Only **c34**

N. V. Derendyayev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 45 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Oct. 1983 p 1073-1076 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A method is proposed for solving the plane problem of small-scale stability of steady rotation of a cylinder completely filled with a stratified viscous incompressible fluid. The angular velocity of rotation of the cylinder is assumed to be held constant, and its axis is secured in an axisymmetrical viscous elastic mount. An example of the solution of the stability problem using the proposed method is given. It is established that resonant excitation of internal waves within the rotating fluid filling the cylinder is an important factor underlying the occurrence of instability. An example is given of the investigation of the stability of steady rotation of a cylinder completely filled with a stratified viscous incompressible fluid whose distribution density in steady-state rotation is RHO zero (r) = RHO zero exp (alpha r(2)), and whose viscosity distribution RHO zero (r) has a characteristic spatial scale no smaller in order of magnitude than the radius of the cylinder.
Author

N84-32055# Joint Publications Research Service, Arlington, Va.
FORMATION OF COHERENT STRUCTURES BY ACOUSTICAL EFFECTS IN A TURBULENT WAKE Abstract Only c02
N. N. Yanenko, S. P. Bardakhanov, and V. V. Kozlov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 45-46 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 1, 1984 p 50-53 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A study is made of the transformation of acoustical disturbances to vortex disturbances, i.e., coherent structures, in a turbulent wake beyond a thin plate with a sharp trailing edge. Experiments were performed in a subsonic wind tunnel at the author's institute with a cross section of 0.2 x 0.2 m at a flow speed U infinity = 10 m/s. The wake was formed downstream from a 300 mm plate with sharp leading and trailing edges and maximum thickness of 3 mm. A special turbulizer was used. Acoustical disturbances were produced by an audio oscillator and loudspeaker installed in the wall of the wind tunnel. Mean flow parameters and pulsation characteristics were recorded and processed by a 'DISA' heat-loss anemometer and FAT-1 frequency analyzer. It was shown that the audio oscillations are intensively converted to vortex disturbances in the turbulent wake downstream from the plate and occur in laminar flows.
Author

N84-32056# Joint Publications Research Service, Arlington, Va.
TRANSITION FROM LAMINAR TO TURBULENT FLOW UNDER ACTION OF ACOUSTIC VIBRATIONS Abstract Only c34
A. N. Shelpyakov, A. M. Kasimov, and G. P. Isupov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 46 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 560-563 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An experimental study was made of the transition from laminar to turbulent flow, with the formation of two conical jets, under the action of acoustic vibrations. The experiment was performed with air discharge through a capillary nozzle, using a smoke generator for visualization, a sound generator for acoustic action, a piezoelectric crystal for measurements, and a camera for recording the flow pattern. A laminar jet was found to be most sensitive to acoustic vibrations at a frequency of 9 kHz and, therefore, the sound generator was operated at that frequency. Slight frequency deviations were found to change the positions of both cones relative to the sound generator. The effect of smoke particles and air preheating on the test results was determined by separately aiming the jet at a water surface and recording the velocity distribution in this configuration. The study revealed the existence of diverse acoustic segments in a laminar stream and a substantial difference between laminar-to-turbulent transitions with or without acoustic action respectively.
Author

N84-32057# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF GAS JET IN LIQUID Abstract Only c34
V. A. Surin, V. N. Yevchenko, and V. M. Rubin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 47 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 542-554 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A comprehensive experimental study was made of discharge of a gas jet from an orifice and its evolution in a liquid medium. Nitrogen, air, helium, chlorine, carbon dioxide, hydrogen chloride, ammonia, and water vapor superheated to 200 to 250 C were discharged vertically up, vertically down, or laterally into water at 18 to 100 C as well as into aqueous solutions of KOH and NaOH, under pressures varied from hydrostatic to 41x10(5) Pa. They were discharged through sonic cylindrical, conical nozzles and supersonic leLaval, axisymmetric, flat nozzles with orifices 2 to 50 mm wide. The discharge velocity varied from 2 to 1000 m/s and the jet underexpansion ratio varied from 1 to 20. The study has yielded data on the mechanisms of gas-liquid interaction, structure and dynamics of the interaction space, and dependence of those on the discharge conditions and on the degree of gas assimilation. Experiments were performed in both continuous and pulse modes, the latter for a study of transients and back shocks.
Author

N84-32058# Joint Publications Research Service, Arlington, Va.
FREE OSCILLATIONS OF IDEAL STRATIFIED FLUID IN CONTAINER Abstract Only c34
N. D. Kopachevskiy and A. N. Temnov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 47-48 Transl. into ENGLISH from Zh. Vychislitelnoy Mat. i Mat. Fiz. (Moscow), v. 24, no. 1, Jan. 1984 p 109-123 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Oscillations of an ideal imcompressible fluid with a density which at standstill varies in the vertical direction are analyzed, assuming that the fluid container of arbitrary shape, has finite dimensions and is stationary. The problem is formulated for such a fluid completely filling a closed container with an initially stable stratification and for small movements under forces of gravity and buoyancy occurring within its volume. The corresponding equations for the velocity field, deviation of the pressure field from the static one at equilibrium, and deviation of the density field from the initial one are linearized in the Boussinesq approximation. A solenoidal displacement field is then introduced and the equation for the density field kinetics is integrated with respect to time. The resulting initial-value boundary-value problem is put in the form of an operator equation, upon introduction of both inherent and necessary Hilbert spaces. The oscillation spectrum at constant buoying frequency is analyzed next, including natural oscillations found from the corresponding eigenvalue problem, specifically for the case of exponential stratification in a cylindrical container.
M.G.

N84-32059# Joint Publications Research Service, Arlington, Va.
SIMILARITY CRITERIA FOR SPECTRA OF PRESSURE FLUCTUATIONS IN TURBULENT BOUNDARY LAYER AT WALL Abstract Only c34
B. M. Yefimtsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 49 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 58-61 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Spectra of pressure fluctuations in turbulent boundary layers at a wall are analyzed for the purpose of generalization on the basis of three dimensionless criteria: Mach number, Reynolds number and Strouhal number. Semiempirical relations are established for the dimensionless spectral density of such fluctuations as function of those three numbers, low and high ranges of each of these numbers being charactaerized by different trends of that spectral density function. The relations are based on experimental data covering a wide range of zero-gradient flow of air past aircraft wings and through wind tunnels, those data having been analyzed

statistically according to the theory of random processes and the theory of similarity. Dependence of the spectral density on the Mach number is manifested by changes in the average local frictional stresses at the wall as well as in the density and the kinematic viscosity of air. Transition from a spectral density independent of St to one inversely proportional to the two-thirds power or the ten-thirds power of St occurs within the St = 200 to 300 range and depends on whether St << 1.3Re(7/8) or St= 1.3 Re(7/8) respectively. Transition from a spectral density independent of Re to one proportional to the one-seventh power of Re (while remaining independent of St) occurs within the Re = 2000 to 3000 range. Author

N84-32060# Joint Publications Research Service, Arlington, Va.
NONCONTRADICTORY METHOD OF CALCULATING RADIATION TRANSFER, AND PROBLEM OF SHOCK WAVE STRUCTURE Abstract Only **c34**
A. I. Vyskrebentsev, V. A. Nuzhnyy, and Yu. P. Rayzer *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 51 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 42-47 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Detail numerical calculations of equations of radiation transport and gas dynamics for a steady shock wave in air done by Zinn and Anderson have shown that for waves with amplitude near the critical point the iteration process does not converge to a final solution. This would seem to indicate that supercritical steady-state shock waves cannot exist. The problem of shock wave structure is analyzed with consideration of radiant heat exchange in the one-dimensinal steady state in a coordinate system fixed to the wavefront. The iteration procedure used in solving the problem eliminated the possibility of contradiction by matching the computational procedure with the factors that do not allow the temperature at any point in front of the shock to rise above the temperature behind the wavefront. The procedure yields temperature distribution in complete qualitative agreement with predictions of analytical theory, unambiguously demonstrating the fundamental possibility of existence of supercritical waves. Author

N84-32061# Joint Publications Research Service, Arlington, Va.
GASDYNAMIC STUDY OF MODEL WITH COMBUSTION IN SHOCK TUNNEL Abstract Only **c09**
V. K. Bayev, V. V. Shumskiy, and M. I. Yaroslavtsev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 51-52 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 58-66 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The experimental difficulties involved in studies of supersonic or hypersonic airflows on facilities with combustion processes have led to the idea of using high-enthalpy facilities with short test time. However, the earliest attempts at using shock tubes for this purpose were not completely successful because times of the order of 3 ms are simply inadequate for studying the working process and force characteristics. Shock tunnels can provide a working time from a few hundredths to several tenths of a second, and initial research has shown that they should be completely suitable for testing models with combustion in a high-enthalpy airflow. The results of such studies in the IT-301 shock tunnel on a gas dynamic model with hydrogen combustion are given. The purpose of the research was to determine the force characteristics of the model, compare theoretical and experimental data, evaluate weight measurements of completeness of hydrogen combustion inside the model, and determine the effect that operation of the internal duct has on operation of the airscoop of the model. Author

N84-32062# Joint Publications Research Service, Arlington, Va.
HYPERSONIC THREE-DIMENSIONAL FLOW OF RADIATING GAS AROUND WING Abstract Only **c02**
A. I. Golubinskiy and V. N. Golubkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 52 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 71-78 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

When a vehicle enters the upper layers of the atmosphere at velocities near escape velocity, radiation may have an appreciable effect on the flow of gas around the vehicle, and radiative heat losses may be comparable with convective losses, or even greater. Three-dimensional hypersonic flow around a wing at a finite angle of attack is studied with consideration of radiation at high temperature. It is assumed that the compressed gas layer adjacent to the windward surface of the wing is optically transparent, i.e., the mean free path of radiation is much greater than the characteristic thickness of the compressed layer. Absorption of radiation in the gas is disregarded, which is justified for flight altitudes that are not too high. The state of the gas is taken as equilibrium before and after the head shock wave. The thin shock layer method is used to find a general solution of equations of gas dynamics expressing all flow parameters in terms of the shape of the head shock wave. The problem of determining waveshape is formulated, and a class of exact solutions is obtained. An investigation is made of the influence that radiation has on thickness of the shock layer, temperature, and pressure distribution. The distribution of radiative heat flux toward the wing is calculated. Author

N84-32063# Joint Publications Research Service, Arlington, Va.
HYPERSONIC FLOW OF VISCOUS GAS ON SURFACE OF BLUNT CONE WITH STRONG BLOW-IN IN BLUNTED REGION Abstract Only **c02**
Yu. N. Yermak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 53 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), v. 142, no. 6, Nov. - Dec. 1983 p 94-101 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An investigation is made of the problem of gas absorption by the lateral surface of a cone when the gas is blown into the region of slight bluntness of the cone. It is assumed that the cone is located in a laminar hypersonic flow of viscous gas. In the vicinity of the bluntness, the gas is blown in so that the boundary layer is displaced from the surface and becomes a mixing layer with thickness much less than that of the blown in gas. The thickness of the blow in layer in turn is much less than the thickness of the shock layer, and the thickness in this layer is described by equations of an inviscid boundary layer. The blow in layer remains inviscid at some distance downstream and on the lateral surface of the cone, where blow in stops. Beyond this point the gas layer is absorbed by the boundary layer on the surface of the body and by the mixing layer is absorbed by the boundary layer on the surface of the body and by the mixing layer on the contact boundary with the hot gas behind the shock wave. M.A.C.

N84-32064# Joint Publications Research Service, Arlington, Va.
COEFFICIENT OF SURFACE FRICTION WITH TURBULENT FLOW IN BOUNDARY LAYER Abstract Only **c34**
V. M. Kapinos *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 58 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 46, no. 1, Jan. 1984 p 51-56 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Taking a previously proposed approximation of the Thompson weighting function and an algebraic expression for a family of velocity profiles as a basis, a system of two equations is proposed that describe the friction law in implicit form as a dependence of the friction coefficient on the form factor H and the Reynolds number Re(theta), taking the thickness of momentum loss as the characteristic linear dimension. The graphic Thompson relaton is reconstructed by using these equations. To simplify calculations, an approximation of the solution of the equations is given that is valid over a wider range of form factors H and Reynolds numbers Re(theta) than the Ludwieg/Tillman relation. M.A.C.

N84-32065# Joint Publications Research Service, Arlington, Va.
IMPROVING ENERGY PERFORMANCE AND DUTY TIME OF PRODUCTION PROCESS CW ELECTRICAL IONIZATION CO2 LASERS BY USING FIVE-COMPONENT LASING MIXTURES Abstract Only **c36**
A. P. Averin, N. G. Basov, Ye. P. Glotov, V. A. Danilychev, O. M. Kerimov, M. M. Malysh, A. M. Soroka, V. Ye. Tsepelev, and N. V. Cheburkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 60 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 20, 26 Oct. 1983 p 1224-1228 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An experimental study of an electrical ionization CO(2) CW laser to determine the optimal mixture composition is presented. The use of five components in the lasing medium, CO2:CO:N2:Ar:He at concentrations of [CO] approximately equal to [CO] and [Ar] greater than or aproximately the same as [He], makes it possible to attain physical efficiency of 13% with a specific volumetric energy output of 2kW/cubic meter/sec during CW operation for several hours. This is significantly higher than the parameters achieved using traditional three component (CO2:N2:He) mixtures at the present time. The evolution of the beam current density for a CO2 laser with a nominal power of 10 KW is plotted for various component ratios as a function of time between 0 and 3 hrs; a nearly flat curve increasing over 3 hrs is obtained for a CO2:CO:N2:Ar:He ratio of 1:5:5:5:4. M.A.C.

N84-32066# Joint Publications Research Service, Arlington, Va.
IRIS PULSING RUBY LIGHT SOURCE Abstract Only **c36**
Yu. F. Morgun, M. A. Muravitskiy, and L. A. Lavrosvkiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 63 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 34, no. 4, Oct. 1983 p 684-687 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The IRISruby laser emits either nanosecond or microsecond light pulses for high resolution holography and spectroscopy, and is also suitable for holographic interferometry, lidar and other applications. Its optical equipment includes a laser for convenient adjustment of resonator components and alignment of the main laser beam. Its electrical components include two power supplies, each for one of the flash lamps pumping the laser. Results of tests and measurements indicate that radiation from this device has a high degree of space coherence and stable spectral characteristics. This laser can operate in two monopulse modes at a repetition rate of 0.1 Hz and with a beam divergence angle of 10-25' in each mode. Uses include study of substances by the method of stimulated Brillouin scattering with narrow-spectrum radiation. Operation of this laser requires eye protection. M.A.C.

N84-32067# Joint Publications Research Service, Arlington, Va.
NEW TYPE OF DYE LASER WITH LIGHT-INDUCED DISTRIBUTED FEEDBACK Abstract Only **c36**
A. D. Dasko, A. A. Muravyev, A. N. Rubinov, S. A. Ryzhechkin, and T. Sh. Efendiyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 70 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 47, no. 12, Dec. 1983 p 2408-2414 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The characteristics of a distributed feedback dye laser are described. The laser emits a narrow line with a broad pumping spectrum, and at the same time is simple and small in size. The proposed laser comprises a cell with dye solution that has a transmitting phase holographic grating on the input face. The pumping beam is incident perpendicular to this grating, and at the output from the grating it is split into three beams corresponding to the +1, 0 and -1 diffraction orders. Substitution of a holographic phase grating for the optical arrangement ordinarily used for shaping pumping beams that interfere in the active medium relaxes the requirements for time and space coherence. An experimental verification of the proposed design shows that a lasing line with width of 0.24 per cm can be emitted when the width of the pumping spectrum is 616 per cm. This performance can be improved by simple modifications. M.A.C.

N84-32068# Joint Publications Research Service, Arlington, Va.
APPARATUS BASED ON HOLOGRAPHIC FOCUSING DIFFRACTION GRATING FOR MEASUREMENT OF DIFFRACTION EFFICIENCY OF THREE-DIMENSIONAL IMAGE HOLOGRAMS Abstract Only **c35**
T. N. Paramonova and Yu. N. Denisyuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 81 Transl. into ENGLISH from Optika i Spektroskopiya (Leningrad), v. 55, no. 6, Jun. 1983 p 1048-1052 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

An apparatus is proposed for quality control of photographic materials used in Lippman holography. A holographic focusing diffraction grating is used as a dispersive element and a selenium photocell as the photoreceiver. The output signal from the latter is amplified by a special-purpose electronic circuit including a K14OUD8A operational amplifier and then measured with a voltmeter. The light source is an SI6-100 photometric lamp with a ribbon filament and an EPS-132 stabilized power supply. Measuring the diffraction efficiency of three-dimensional image holograms on such materials requires a Seya-Namioka setup of monochromator and diffraction grating for minimum defocusing of the image in the exit slit during rotation of the grating and then leaving the slit in fixed position. The diffraction efficiency is read directly and the integral diffraction efficiency are calculated on the basis of corresponding geometrical and physical-optics relations. The spectral light-source energy distribution and the spectral photoreceiver sensitivity distribution must be known for the integral diffraction efficiency. Author

N84-32069# Joint Publications Research Service, Arlington, Va.
NEWLY DISCOVERED EFFECT OF INTERACTION OF OPTICAL RADIATION AND GLASS Abstract Only **c74**
L. B. Glebov, V. G. Dokuchayev, N. V. Nikonorov, and G. T. Petrovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 85-86 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 3, Jan. 1984 p 568-571 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Mechanical stresses were discovered in glass which build up during formation of color centers as a result of optical irradiation. These mechanical stresses were recorded by the method of photoelasticity, in the direction of the activating light beam. The already known effects of dichroism had to be eliminated by using circularly rather than linearly polarized activating radiation. A konoscopic pattern as revealed analogous to that produced by nonuniform axisymmetric heating of optical materials. These stresses are explained by ionization of intrinsic centers and capture of released electrons by traps, with resulting change in the charged state of centers as well as in lengths and angles of bonds around centers. These stresses are related to the radiation power density distribution and to the birefringence. B.G.

N84-32070# Joint Publications Research Service, Arlington, Va.
SOURCE OF OPTICAL PUMPING FOR HIGH-RESOLUTION SPECTROSCOPY WITH SEMICONDUCTOR LASER Abstract Only **c36**
L. A. Budkin, O. G. Okhotnikov, G. T. Pak, A. I. Pikhtelev, and S. L. Puzanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 92 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 40, no. 1, Jan. 1984 p 165-167 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A source of optical pumping for semiconductor lasers used in high-resolution spectroscopy was built on the basis of a frequency-tunable laser diode. This diode is mounted on a heat sink inside a thermostat with temperature regulation and stabilization. Radiation emitted by this diode passes through an objective of an absorption cell containing study material, typically vapor of an alkali metal. Changes in absorption are detected by a photodetector and either

chart-recorded or read on a voltmeter. Source of optical pumping was tested for total error in spectroscopy of the D2-line in the absorption spectrum of 133(Cs), and was found to be suitable for semiconductor lasers operating in the 700 to 900 nm and 1300 to 1700 nm ranges of wavelength. Performance characteristics were found to be better than monochromators with diffraction gratings or standard Fabry-Perot interferometers, being furthermore much smaller and more energy efficient. Author

N84-32071# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF STRONG NONLINEAR-OPTICS EFFECTS IN LIQUID CRYSTALS Abstract Only c76
S. D. Darbin, S. M. Arakelyan, M. M. Cheung, and Y. R. Shen *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 99 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 47, no. 12, Dec. 1983 p 2464-2475 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Nonlinear optical effects that arise in nematic liquid crystals as a result of a change in the index of refraction induced by a laser field are considered. Since the resultant nonlinearity is extremely high, the approximation of perturbation theory cannot be used in calculations. However, the change in refractive index results mainly in phase advance as waves propagate through a thin film of liquid crystal, while the change of intensity is significant. Moreover, if there is no change in polarization of the pumping field, calculations are relatively simple. An investigation is made of the propagation of a cross sectionally bounded laser beam through a homeotropically oriented liquid crystal, giving rise to spatial phase modulation of emission. When the intensity of the laser beam exceeds a certain value, a system of aberation rings is observed in the output radiation. Effects of dynamic self-diffraction accompanying degenerate four-wave mixing when a change in refractive index is induced in a homeotropic liquid crystal film, and optical bistability in a nonlinear Fabry-Perot optical cavity, as well as generation of a self-oscillatory state in such a resonator are discussed. Author

N84-32072# Joint Publications Research Service, Arlington, Va.
DOUBLE SCATTERING BACKGROUND IN A CW LIDAR Abstract Only c36
A. V. Sinyavskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 111 Transl. into ENGLISH from Izv. Akad. Nauk Armyanskoy SSR: Fiz. (Yerevan, USSR), v. 18, no. 5, Sep. - Oct. 1983 p 291-295 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The equation for lidar probing of a homogeneous medium is written for the case of two-fold scattering in terms of the radiated power, speed of light, the back-scatter coefficient, path attenuation, the one-time scattered signal from the given range, the normalized scattering indicator in the back direction, the scattering coefficient and the angular field of view of the receiver. The solution of this equation is an estimate of the contribution of information contained in a doubly scattered signal from a CW lidar, modulated by a sine wave. An analytical expression is derived for the phase of the received signal and the change in the modulation level with double scattering. The equations are used to plot the phase and modulation level for modulating frequencies of 100 KHz, 1 MHz and 10 MHz as a function of the path attenuation. An expression is also adduced for the ratio of the power of the ac component of a double scattered transmission to the analogous component of a one-time scattered signal. The behavior of this function shows that the doubly scattered signal is greatly dependent on the type of scattering aerosol and thus permits the possibility of identifying an atmospheric aerosol by studying such signals. Author

N84-32073# Joint Publications Research Service, Arlington, Va.
RESONANCE AND EDGE AMPLIFICATION OF AN ELECTRIC FIELD IN A PLASMA RESONANCE LAYER AND ACCELERATION OF PARTICLES AT PLASMA INHOMOGENEITIES Abstract Only c75
G. A. Askaryan and S. V. Bulanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 117 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 20, 26 Oct. 1983 p 1243-1247 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Field amplification and the acceleration of particles which transit a flat plasma layer in an external sinusoidal electric field in the plasma resonance range are possible, where the electric field has a component perpendicular to the plasma surface. The field intensity in the resonance layer is sharply increased under certain conditions. The energy of the charged particles passing through the resonance layer can rise. The possibility of such phenomena at the vertices of sharp points due to point amplification of the field, polarization resonance and antenna resonance are outlined. The conditions for these three effects are discussed without adducing any experimental data or sample calculations. It is noted that the amplification of an edge field leads to the intensification of the field in the purely plasma resonance region located in the edge area of the concentration gradient decline. It is found that field amplification and particle acceleration can be utilized to boost the energies of accelerated particles and for high efficiency microwave voltage and current generators and streamer particle acceleration. E.A.K.

N84-32074# Joint Publications Research Service, Arlington, Va.
NONLINEAR DYNAMICS OF RESONANCE-TYPE INSTABILITY IN HIGH-DENSITY ELECTRON BEAM: ANALYTICAL SOLUTION Abstract Only c72
M. V. Kuzelev and V. A. Panin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 125-126 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 27, no. 1, Jan. 1984 p 31-35 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Instability of a straight high density electron beam propagating through a slow wave structure was analyzed. The solution is possible because a high density which implies a small frequency deviation of plasma oscillations and a resonance mode of instability. The dynamics of resonance instability resonance stabilization are examined as the nonlinear mechanism, specifically cubic nonlinearity which is analogous to burst type instability. The initial value or transient problem for the corresponding system of equations of instability evolution is solved, followed by the more important boundary value problem. The solution is simple by adiabatic application of the electric field, however, in the nonadiabatic real case it is more intricate. E.A.K.

N84-32075# Joint Publications Research Service, Arlington, Va.
COOLING OF SEMIINFINITE BODY UNDER CONDITIONS OF NONLINEAR HEAT TRANSFER AT SURFACE Abstract Only c77
Yu. I. Babenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 130 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 633-635 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

The problem of convective heat transfer at a surface with a nonlinear boundary condition is solved for cooling of a semiinfinite body, with a boundary condition of. The surface temperature as function of time is determined. When the temperature field is not sought, the method of solution becomes simple and yields an asymptotic law of heat transfer toward the end of the transient period. The solution is sought in the form of a power series. E.A.K.

N84-32076# Joint Publications Research Service, Arlington, Va.
CONDITIONS OF FILTRATION BURNING OF POROUS CONDENSED SYSTEMS WITH MULTIPLE PASSAGE OF REACTION WAVE Abstract Only c25
O. S. Rabinovich, S. N. Krasilshchikov, and I. G. Gurevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 130 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 46, no. 1, Jan. 1984 p 71-77 (For primary document see

N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Possibilities for optimizing technological processes which involve filtration burning with repeated passage of the reaction wave are considered. It is shown that the condition of constant combustion temperature for the entire sequence of waves yields a simple expression which characterizes efficiency of multiwave filtration combustion models. An expression was derived for the rate of wave propagation of exothermic reaction in the case of nonzero initial depth of conversion of the material being processed. The analysis is based on a system of equations of heat and mass transfer and chemical kinetics describing this wave process. It is shown that waves traveling in the same direction, increase the number of waves which enhances the effect of using a multiwave filtration combustion process, approaching some limit that depends on the conditions of process organization. Analysis of the relative increase in efficiency of the multiwave mode of filtration burning as a function of the number of waves shows that a 2 to 4 wave process is of interest for waves traveling in the same direction. E.A.K.

N84-32077# Joint Publications Research Service, Arlington, Va.
STABLE METHOD FOR SOLVING LINEAR PROGRAMMING PROBLEM WITH APPROXIMATE DATA Abstract Only c61
A. N. Tikhonov, A. A. Ryutin, and G. M. Agayan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 132 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Oct. 1983 p 1058-1063 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Liner programming problems with the matrix and right part of the limitations assigned approximately are stated and investigated; the existence of a unique solution to the corresponding regularization problem is proposed, and stable methods for solving the problems are proposed. The concept of acceptable solutions of an approximate system of linear algebraic equations with allowance for limitations is employed. The regularization linear programming problem with approximately assigned limitations is stated on the basis of determining the acceptable solution of the approximate system. A numerical example is given. Author

N84-32078# Joint Publications Research Service, Arlington, Va.
TWO-PHASE METHODS OF SOLVING CANONICAL PROBLEM OF LINEAR PROGRAMMING Abstract Only c61
R. Gabasov, F. M. Kirillova, O. I. Kostyukova, and A. A. Senko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 132 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (Minsk), v. 27, no. 9, Sep. 1983 p 787-790 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Two methods are proposed for solving the canonical problem of linear programming c'x yields max; Ax= b for d(*) < x < d*, where A(I,J) is an mXn matrix with I= [1,2,...,m< I and J= [1,2,...,n]. The direct two-phase method yields the epsilon-optimal plan in a finite number of iterations for every epsilon =or > 0 and any initial plan x. This method is applicable when A lambda does not equal 0 and when A = 0. The dual two-phase method yields the epsilon-optimal plan for every epsilon = or > 0 any initial coplan delta, or it reveals the inconsistency of its constraints. The validity of both methods has been verified by a numerical experiment on a BESM-6 high-speed computer, with the problem also solved by the conventional simplex two-phase method. Author

N84-32079# Joint Publications Research Service, Arlington, Va.
ECONOMICAL MULTIPLICATION OF BOOLEAN EQUATIONS Abstract Only c64
Yu. I. Zhuravlev and N. M. Platonenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 133 Transl. into ENGLISH from Zh. Vychislitelnoy Mat. i Mat. Fiz. (Moscow), v. 24, no. 1, Jan. 1984 p 164-166 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

Systems of Boolean equations are considered where the Boolean functions reducing cannot be put in the form of linear mod-2 functions of their arguments. There is only one universal method of solving such a system of equations, namely reducing it to a system and then the latter to an equivalent single equation with the left-hand side subsequently represented in the disjunctive normal form, then solving successively the trivial equations. This method becomes ineffective and impractical for large m. Another method is therefore proposed which, though not universal, ensures an economical multiplication process in many cases. The problem is reduced to the problem of assignments with minimization of complexity. A quantitative analysis requires only lower-bound estimates, a quantitative solution requires upper-bound or both estimates. The problem is solved beginning with a numerical matrix symmetric with respect to its diagonal and following with a partition of the system of equations into maximally weighted equation pairs in such a way as to minimize the resultant complexity after multiplication of the left-hand sides. Author

N84-32080# Joint Publications Research Service, Arlington, Va.
SEQUENTIAL METHOD OF MINIMIZING NONLINEAR FUNCTION ON SIMPLEX Abstract Only c64
V. S. Mikhalevich and N. N. Redkovskiy. *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 133 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 3, Jan. 1984 p 544-547 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

A numerical method is proposed for minimizing a function on a set. The method combines sequential analysis of variants and algorithms with accelerated convergence. It subdivides the simplex S(u) on each minimization step into subsimplexes of dimensonality m = or <n <N. A rule can be constructed for selection of indices j in set I(m) which define the subsimplex on which minimization is being performed. An appropriate change of variables will reduce the original minimization to minimization of function and a sphere. The procedure is shown for a positive fixed number and a sequence tending to zero. Two theorems are stated, one pertaining to the necessary condition for existence of a minimum and one pertaining to estimates of the convergence rate. Author

N84-32081# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS
15 Aug. 1984 110 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UPM-84-005) Avail: NTIS HC A06/MF A01

Topics in the following categories are discussed: acoustics, crystals, semiconductors, electricity, magnetism, fluid dynamics, lasers, masers, optics, spectroscopy, molecular physics, optoelectronics, plasma physics, theoretical physics, and mathematics. For individual titles, see N84-32082 through N84-32109.

N84-32082# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EXCITATION OF SOUND IN METALS Abstract Only c32
A. N. Vasilyev and Yu. P. Gaydukov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 2-3 Transl. into ENGLISH from Uspekhi Fiz. Nauk (Moscow), v. 141, no. 3, Nov. 1983 p 431-467 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The excitation of acoustic vibrations in a metal by an electromagnetic wave incident on its surface is considered. Various mechanisms of contactless conversion under conditions of the anomalous skin effect were analyzed. It is shown that, in a sufficiently strong magnetic field, induction interaction makes a major contribution to the transformation process. In the absence of a constant magnetic field, dynamic equilibrium between the forces acting on the part of the electrons and on the part of the external field may be disturbed when electrons are scattered by the metal interface. The excitation mechanism due to diffuse scattering of electrons by the surface becomes significant on microwave frequencies. Distinguishing features of electromagnetic

excitation of sound were determined for semimetals, superconductors, and ferromagnetics. The ratio of the strain potential tensor to the Fermi energy is larger in semimetals than in normal metals. Non-contact excitation of sound provides a technique for acoustic nuclear magnetic resonance and a way to study a variety of interactions of collective excitations in metals with sound waves.
Author

N84-32083# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EXCITON MOVEMENT IN MAGNETIC FIELD ON LUMINESCENCE. INDIRECT FORBIDDEN TRANSITIONS IN Ge Abstract Only
V. D. Kulakovskiy and V. M. Edelshteyn *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 8 Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (Moscow), v. 86, no. 1, Jan. 1984 p 338-342 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The band structural characteristics of Ge were exploited in order to create an experimental situation in which the free nature of exciton movement is manifested most fully. The ratio of the integral intensities of radiation-free excitons in forbidden and allowed components were compared experimentally and analytically as a function of the magnetic field; the ratio is shown to increase as the magnetic field becomes stronger.
Author

N84-32084# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EFFECTS IN STRONG FIELD OF SINGLE CRYSTALS Abstract Only c76
V. V. Lasukov and S. A. Vorobyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 10 Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (Moscow), v. 86, no. 1, Jan. 1984 p 94-99 Original language document previously announced in IAA as A84-25607 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

It is demonstrated that a situation exists which is accessible to modern experimental techniques from the point of view of investigating the quantum electrodynamics in an intense external field. Consideration is given to the photo-production and electro-production of relativistic e(-)e(+) pairs where each of the two components executes nonrelativistic finite motion in the transverse direction and free relativistic motion along the crystallographic axis or plane. The process for the electroproduction of pairs described here can be used as a monochromatic source of relativistic pairs of the positronium type; it can also be used in investigating nonlinear quantum effects on the basis of this process.
Author

N84-32085# Joint Publications Research Service, Arlington, Va.
NONEQUILIBRIUM OPTICAL AND ACOUSTIC PHONONS IN SEMICONDUCTORS Abstract Only c76
Yu. G. Gurevich and O. L. Mashkevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 13 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 1, Jan. 1984 p 120-125 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

A cubic semiconductor with one type of carrier was examined in order to derive kinetic equations for nonequilibrium electrons and optical and acoustic phonons. The two-stage acousto-optical entrainment is mutual: the thermal phonon flux depends upon the electrical and magnetic field and the temperature gradient in the electron subsystem. The applicability conditions for diffuse approximations for optical phonons are given.
Author

N84-32086# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF STATISTICAL CHARACTERISTICS OF RANDOM SIGNALS IN NONLINEAR MEDIUM Abstract Only c32
A. S. Gorshkov, L. G. Lyashedko, and I. T. Trofimenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 21 Transl. into ENGLISH from Vestn. Mosk. Univ.: Ser. 3 Fiz. Astronomiya (Moscow), v. 25, no. 1, Jan. - Feb. 1984 p 103-105 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The distribution function of narrowband noise in a nonlinear distributed transmission line with weak dispersion was investigated experimentally. An expression for the distribution function is derived that allows for quadratic and cubic nonlinearity and frequency-independent losses. The non-linear, weakly dispersing medium was modeled by a low-pass filter with varicaps serving as nonlinear capacitances. Cubic nonlinearity of the medium results in asymmetry of the distribution function for positive and negative noise voltage values.
Author

N84-32087# Joint Publications Research Service, Arlington, Va.
OSCILLATIONS OF ELASTIC AIRPLANE DUE TO WIND GUST Abstract Only c05
A. V. Ivanova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 23 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The reaction of a sweptback wing aircraft at constant speed to a single gust of wind with arbitrary speed distribution was investigated. The wing is considered a thin and elastic bar, and the fuselage as a heavy body capable of vertical movement and rotation around the center of gravity. Symmetrical oscillations are considered. A set of differential equations is developed describing combined flexional-torsional oscillations of a thin-walled bar, taking into account the transverse cross-section deformation and displacement. There are boundary conditions for the free end of the bar and for the union of wing and fuselage. The introduction of a dimensionless time factor and an aerodynamic load expression leads to the final form of the equations for which specific gust conditions are chosen.
Author

N84-32088# Joint Publications Research Service, Arlington, Va.
SUPERSONIC NONSTEADY FLOW PAST FLAT AND AXISYMMETRIC POINTED BODIES Abstract Only c02
Ye. A. Potekhina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 23-24 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 80-83 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The movement of a flat or axisymmetric sharp body with a curvilinear generatrix in a quiescent gas at supersonic speed is considered. Using Lagrange variables, a system of equations is formulated and integrated to determine the parameters of the gas flow in the shock wave between the front of the shock wave and the surface of the body. The solution involves the fact that the sojourn time of gas particles in the shock wave is considered small and parameter values fall as the speed of motion of the body increases. Comparison of the approximation estimate with the result of the characteristic method computations (M= infinity) yielded an error of less than 7% and with experimental data (M= 2.3) showed and error of the order of 13%. Effectiveness was, however, computed for a steady state example which is least suitable for the method that operates best for nonsteady flow.
Author

N84-32089# Joint Publications Research Service, Arlington, Va.
SUPERSONIC JET-CAVITY INTERACTION PULSATION Abstract Only c02
A. I. Kotov and Ye. A. Ugryumov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 24 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 64-68 Original language document previously announced in IAA as A84-25615 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Results are presented from a numerical investigation employing the Godunov method of the low-frequency pulsations seen in the interaction between a supersonic jet and a cavity. The process by which self-oscillations develop after the pulsed triggering of the nozzle is examined. The way in which the magnitudes of pressure

and frequency that are characteristic of the pulsations depend on parameters of the incoming jet and the dimensions of the jet and cavity is determined. The results obtained from numerical computations are compared with experimental data in the literature. Methods are proposed for estimating the pressure during pulsations using known formulas. C.R.

N84-32090# Joint Publications Research Service, Arlington, Va.
DIFFUSION TRANSFER DURING NEAR-SONIC TURBULENCE Abstract Only **c02**
A. M. Krugel *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 27-28 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 53, no. 11, Nov. 1983 p 2282-2283 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Corrections are made to the Einsteinian formula relating the coefficient of diffusion to the speed of sound and to the adiabatic exponent for turbulence that is strong in the sense that the kinetic energy density of the turbulence is comparable to the internal energy density. The effective temperature of a turbulent gas is incremented by an amount proportional to the ratio of the turbulence energy to the thermal motion energy, with a corresponding change in the pressure, the adiabatic acoustic velocity of the turbulent gas and the expression for the coefficient of diffusion. The corrections derived are valid only when the average velocity of the turbulent fluctuations is high enough. Author

N84-32091# Joint Publications Research Service, Arlington, Va.
FLOW STRUCTURES AND THEIR EVOLUTION IN TURBULENT SHEAR LAYER Abstract Only **c34**
G. A. Kuzmin, O. A. Lukhachev, and A. Z. Patashinskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 30-31 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 74-80 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The flow structure and its evolution in a turbulent shear layer was analyzed. The turbulent motion of a fluid which involves excitation of many strongly interacting degrees of freedom is considered. This motion is neither perfectly random, accessible to simple statistical analysis, nor perfectly coherent, characterized by regular vortex clusters. The analysis is based on two other models, and the Helmholtz instability as the principal mechanism of flow structure evolution studied. The simpler model considers a vorticity distribution initially uniform over a thin boundary layer of a boundless nonviscous fluid. The corresponding Hamilton equations are formulated in the finite dimensional approximation of vorticity, with the total kinetic energy playing the role of internal energy in the Hamiltonian and with the dimensionless intermittence parameters characterizing the evolution process. The more intricate model is a linear array of identically oriented clusters, each consisting of substructures at equilibrium statistically and the number of the latter increasing from some minimum to some maximum in the evolution process. Recurrence relations are derived here, just as for the simpler model, but the influence of and merger with adjacent structures and non-conservative moment of momentum are considered. The evolution is demonstrated. E.A.K.

N84-32092# Joint Publications Research Service, Arlington, Va.
MOTION OF VORTEX PAIR BETWEEN PARALLEL WALLS Abstract Only **c34**
P. I. Geshev and B. S. Yezdin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 31 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 62-67 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The motion of a vortex pair between parallel walls was analyzed kinematically. Such a situation occurs in ideal fluids and in superfluid helium and in strongly magnetic plasma with vortical flow of electrons and ions. The corresponding equations for a two dimensional simply connected bounded region are formulated in terms of the Hamiltonian for an array of N-ideal vortices and conservation integrals for the physical region where they move. In the plane hydrodynamic case the flow function satisfies the Poisson equation and invariance of the Hamiltonian implies existence of an additional conservation integral, a momentum integral when the physical region is a circle or a moment of momentum integral when it is a rectangular strip. The problem is solved by conformal mapping, strip onto unit circle and vice versa. It is shown that the motion of both vortices is completely defined by energy and momentum, each depending on the magnitude and the sign of their circulation ratio and on their initial locations. It is found that the equations of motion are exactly integrable, without stochasticity of trajectories in a manifold of dimensionality like in three vortices moving in a boundless space but unlike four vortices under certain initial conditions. E.A.K.

N84-32093# Joint Publications Research Service, Arlington, Va.
CHEMICAL LASERS **c36**
Yu. Khariton *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 34-35 Transl. into ENGLISH from Pravda (Moscow), 12 Mar. 1984 p 3 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The application and the advances of quantum electronics, specifically, of optical quantum generators lasers is reviewed. Materials are cut, their surfaces are machined, chemical transformations of substances are carried out, surgical operations are performed, data are transmitted, three dimensional images are produced and the content of microimpurities, in the atmosphere, are analyzed by use of a beam. Laser technology is used in conducting investigations in the most diverse fields of the natural and technical sciences from controlled thermonuclear fusion to genetics. Many demands are placed on lasers as sources of light energy. The importance of low weight, compactness of the optical generator and the efficiency of energy conversion processes is emphasized. E.A.K.

N84-32094# Joint Publications Research Service, Arlington, Va.
STUDY OF EMISSION SPECTRUM OF TEA CO2 LASERS WITH INTRACAVITY ABSORBER Abstract Only **c36**
A. B. Vasilyev and A. I. Fedoseyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 38 Transl. into ENGLISH from Vestn. Mosk. Univ.: Ser. 3 Fiz. Astron. (Moscow), v. 24, no. 4, Jul. - Aug. 1983 p 62-64 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The combination of high energy P-branch vibrational/rotational levels with the main laser transition of the CO2 molecule in a laser emission spectrum consisting of several lines, short radiation pulses with lengths equal to the rotational relaxation time increases in power by 20 to 40%. It is shown that by introducing selective losses it was possible to obtain the required simultaneous lasing of the vibrational/rotational lines. The optical cavity consisted of copper mirrors and a heat cell containing CO2 acting as a nonlinear absorber was located inside the cavity. The temperature of the intracavity cell was varied in the range of 400-700 K, and maximum amplification was obtained at 400 K while power fell off at higher levels. E.A.K.

N84-32095# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS IN DEVELOPMENT OF POWERFUL DYE LASER Abstract Only **c36**
G. N. Alferov, V. I. Donin, and G. G. Telegin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 42 Transl. into ENGLISH from Avtometriya (Novosibirsk, USSR), no. 1, Jan. - Feb. 1984 p 82-85 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

A rhodamine 6G laser employing ethylene glycol and water solvent was investigated. Pure ethylene glycol is used to obtain lasing power of 10 watts or more in a rhodamine 6G laser pumped by an argon laser. Aqueous solutions are needed to increase the output power of an ordinary laser. Special chemical additives are required to improve dye lasing efficiency when water is used as the solvent. E.A.K.

N84-32096# Joint Publications Research Service, Arlington, Va.
MULTIFREQUENCY EMISSION FROM SUBMILLIMETER LASERS Abstract Only **c36**
Yu. Ye. Kamenev, Ye. M. Kuleshov, and A. N. Lebedenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 45-46 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 213-214 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Simultaneous excitation of several longitudinal modes in a submillimeter laser is not possible because the lines of lasing transitions are narrower than the frequency separation between longitudinal resonances, millimeter radiation from a waveguide HCN-laser operating on two frequencies with linear parallel polarizations of modes or at three frequencies with linear parallel and linear orthogonal polarizations of modes was studied. The laser was built with a hollow dielectric waveguide between two mirrors as resonator, with the exit mirror consisting of two crossed uniform wire gratings. With the radius of the waveguide fixed, its length or distance between mirrors was adjusted to satisfy the condition for coincidence of the longitudinal resonances of two compound modes. The radiation spectrum of this laser was monitored with a single mode auxiliary HCN laser. Smooth tunability of the frequency difference is the laser is found. The beat frequency of orthogonally polarized models is varied by parallel shifting of one of the two wire gratings. E.A.K.

N84-32097# Joint Publications Research Service, Arlington, Va.
PICOSECOND PARAMETRIC OPTICAL OSCILLATOR WITH AMPLIFICATION OF RADIATION FROM TUNABLE SEMICONDUCTOR LASER Abstract Only **c36**
V. L. Boychenko, I. I. Zasavitskiy, Yu. V. Kosichkin, A. P. Tarasevich, V. G. Tunkin, and A. P. Shotov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 46-47 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 203-205 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Amplification of narrow band seeding radiation is considered as a method of producing finite spectrum picosecond emission pulses from the frequency tunable laser of a parametric optical oscillator for spectroscopy, which requires that emission pulses finite spectrum, a method more effective than use of two crystals. The seeding source must be a wavelength tunable one, with injection lasers on AIIIBV or AIVBVI semiconductors which are suitable for this purpose. A parametric optical oscillator using an LiNbO3 crystal was developed. Such a semiconductor amplifier laser is tunable over the 0.6-40 micro range of wavelengths by controlling temperature, pumping current, pressure or magnetic field intensity. Synchronization of the amplifier laser with the picosecond oscillator laser is achieved a photodiode receiving a part of the oscillator radiation. The oscillator frequency can be varied through a 70 cm to the -1 power range by varying the temperature of the semiconductor laser over the 60-80 K range. E.A.K.

N84-32098# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE CO2 LASER WITH 7.5 W POWER RATING Abstract Only **c36**
A. Ye. Belyanko, N. I. Lipatov, P. P. Pashinin, Yu. N. Polivanov, A. M. Prokhorov, V. V. Sakhanova, and V. Yu. Yurov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 48 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 184-187 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Gas lasers with cylindrical waveguides and electric pumping are considered for scientific and engineering applications. The conditions for maximum continuous wave emission power per unit waveguide length are important as a measure of their performance capability. A CO2 laser was tested with a waveguide made of beryllia and with either direct current or capacitive high frequency discharge available. The laser output power was measured as a function of the gas pressure and discharge current for various CO2-He, CO2-N2-He, and CO2-N2-He-Xe gas mixtures. The advantages of h.f. discharge over d.c. discharge are a much lower electric field intensity needed for sustaining the plasma and use of reactive elements rather than ballast resistors for matching the discharge circuit with the oscillator. Capacitive electrodes can be insulated from the discharge gap by a dielectric coating layer. In compound d.c. and h.f. discharge, which ensures a more uniform glow distribution, h.f. discharge acts as preionizer when its power is higher than the d.c. power, and the d.c. discharge ensures self-sustainace of the plasma when its power is comparable with or higher than the h.f. power. E.A.K.

N84-32099# Joint Publications Research Service, Arlington, Va.
FOCUSERS OF OBLIQUELY INCIDENT LASER RADIATION Abstract Only **c74**
A. V. Goncharskiy, V. A. Danilov, V. V. Popov, A. M. Prokhorov, I. N. Sisakyan, V. A. Sayfer, and V. V. Stepanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 60 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 166-168 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Focusing obliquely incident laser radiation along a given line in space with a given intensity distribution is treated as a problem of synthesizing a mirror surface. The intricate shape of such a surface, characterized by a function z= z (u,v) in the approximation of geometrical optics, is determined from the equation phi (u,v,z) - phi O(u,v,z)=O, which expresses that the incident field and the reflected field have identical eikonals. Further calculations are facilitated by replacing continuous mirror with a more easily manufactured piecewise continuous one. The problem is solved for the simple case of a plane incident wave with a typical iconal phi O(u,v,z)= -z cos0 at a large angle to a focus mirror in the z-plane region. Mirrors constructed on the basis of the theoretical solution were tested in an experiment with a CO2 laser. A light beam with Gaussian intensity distribution was, upon incidence at a 45 deg angle, focused into a circle or into an ellipse with uniform intensity distribution. Improvements in amplitudinal masking and selective tanning technology should reduce energy losses at the surface which results in efficient laser focusing mirrors. E.A.K.

N84-32100# Joint Publications Research Service, Arlington, Va.
FIBER OPTIC LIGHT GUIDES BASED ON POLYMER COATED MULTICOMPONENT GLASSES Abstract Only **c74**
V. V. Grigoryants, V. A. Detinich, A. A. Izyneyev, V. B. Kravchenko, V. P. Minkovich, and Yu. K. Chamorovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 64 Transl. into ENGLISH from Fiz. i Khim. Stekla (Leningrad), v. 9, no. 3, May - Jun. 1983 p 371-373 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The properties of polymer coated fibers made from blanks drawn from a melt of multicomponent glass were examined. The light reflecting coating was a organosilicon compound (elastic siloxane). It is indicated that attenuation is heavily dependent on the conditions under which the glass is heated. The minimum losses at 0.85 micro were 50-70 dB/km. The method can be used to produce fiber optic light guides with moderate losses and to control the total amount of impurities in chemical reagents employed in fiber optics. E.A.K.

N84-32101# Joint Publications Research Service, Arlington, Va.
USING INFORMATION ON TANGENTIAL TARGET MOTION IN SPACE-TIME SIGNAL PROCESSING Abstract Only **c32**
I. Ya. Kremer and A. M. German *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 69 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 1, Jan. 1984 p 57-64 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The description of a space-time signal scattered by a moving point target was considered. An idea of the potential for resolving moving targets, as well as the limits for improving the accuracy of measuring coordinates and velocities in active ranging against a

background of set noise was given. Previous research has shown that the tangential (angular) displacement of a target relative to the reception antenna rotates the phase front and produces linear frequency modulation of the wave scattered by the target. The contribution of each of these factors to the potential capabilities of target resolution with respect to tangential (angular) velocity for various ratios between reception antenna size and target range was considered. An estimate is made of the limiting accuracy of measuring tangential (angular) velocity of a target in active ranging against a background of equipment noise. Based on the earlier space-time description of signals in radar systems with synthesized apertures, the contribution of the physical aperture to angular resolution and to the potential capabilities of measuring the angular coordinate of a target against interference were determined.

Author

N84-32102# Joint Publications Research Service, Arlington, Va.
BREMSSTRAHLUNG FROM LONGITUDINAL PLASMA WAVES PRODUCED BY SUBTHERMAL ELECTRONS IN PLASMA Abstract Only **c75**

A. V. Akopyan *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 74-75 Transl. into ENGLISH from Izv. Akad. Nauk Armyansk. SSR: Fiz. (Yerevan, USSR), v. 19, no. 1, Jan. - Feb. 1984 p 15-19 (For primary document see N84-32081 21-70)

Avail: NTIS HC A06/MF A01

Bremsstrahlung from a longitudinal plasma wave (1-wave) created during collisions of nonequilibrium subthermal electrons with the ions of an isotropic, homogeneous fully ionized plasma is examined. Expressions are derived for the probability and intensity of the radiation for the case of electron-ion pairwise collision. The problem of wave instability during collective retardation of a group of electrons on ions is discussed. Plasma waves with wavelength = to or > .1 cm will grow within a characteristic time of 1/Y .01s for a plasma temperature of approximately .001 eV, plasma and flux densities of n (sup p) approximately 1 to the 15th power/cu cm and n (sub o) approximately 10 to the 10th power/cu cm and average flux velocity u approximately 10 to the 8th power cmls.

Author

N84-32103# Joint Publications Research Service, Arlington, Va.
ENERGY CHARACTERISTICS OF PLASMA GENERATED IN AIR NEAR TARGET BY RADIATION FROM CO2 LASER Abstract Only **c75**

G. G. Dolgov-Savelyev, V. A. Zhuk, A. M. Orishich, A. G. Ponomarenko, V. G. Posukh, and V. N. Snytnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 75 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 3-7 (For primary document see N84-32081 21-70)

Avail: NTIS HC A06/MF A01

Experimental studies of plasma generated in cold air around a target by laser radiation involve measuring the energy absorbed by such a plasma following interaction of the laser beam and the target material. In one experiment an LG-75 CO2-laser (wavelength = 0.63 micron) was used as energy source in an LUI-2 amplifier configuration, with a diaphragm forming a square beam of 9.2 x 92 cm cross section and extracting a single transverse mode. Targets with a low reflection coefficient for radiation at the wavelength = 10.6 micron wavelength (graphite 0.2 and anoidized aluminum 0.04) were placed at one end of a tubular chamber made of polished acrylic plastic sufficiently long for forming a one-dimensional gas flow, with the laser beam entering at the other end. The plasma energy was determined from measurements of the parameters of the subsonic radiation wave and the subsequent shock wave inside the chamber, in accordance with applicable laws of gas dynamics and theory of point explosion.

Author

N84-32104# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF DENSE PLASMA COLUMN IN STRONG MAGNETIC FIELDS AND ITS DIAGNOSIS BY LASER METHODS Abstract Only **c75**

A. V. Arzhannikov, V. S. Burmasov, L. N. Vyacheslavov, and V. S. Koydan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 79-80 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 1, Jan. - Feb. 1984 p 175-182 (For primary document see N84-32081 21-70)

Avail: NTIS HC A06/MF A01

The feasibility of producing a plasma column with electron concentrations of up to 10 to the 16th power/cu cm by means of a high-current Penning discharge and of diagnosing it on the basis of interaction with a laser beam was studied. A discharge in a hydrogen atmosphere under a pressure of 0.001 to 0.1 torr was produced with a voltage of 20 to 60 kV from a 1.6 micro F capacitor bank in a magnetic field of intensity up to 25 KOe. The discharge current was oscillatory, with period of 10 microsec and amplitude of 60 kA, total decay time not exceeding 80 microsec. The plasma was diagnosed by the scattering method with INAR equipment, to provide information about the plasma electron distribution and the effect of heating by an intense relativistic electron beam. Measurements yielded fairly accurate and reliable radial plasma profiles in the infrared region of the spectrum.

Author

N84-32105# Joint Publications Research Service, Arlington, Va.
PLASMA BEAM INSTABILITY OF BOUNDED ELECTRON BEAM IN WEAK MAGNETIC FIELD Abstract Only **c75**

A. A. Ivanov and N. G. Popkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 80 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 1, Jan. - Feb. 1984 p 106-111 (For primary document see N84-32081 21-70)

Avail: NTIS HC A06/MF A01

Plasma beam instability of a space-bounded electron beam in a magnetic field is analyzed, assuming a weak magnetic field and an electron cyclotron frequency much lower than the oscillation frequency of plasma electrons. The fundamental Poisson equation, equation of continuity and equations of motion in a three dimensional Cartesian coordinate system are solved for potential oscillations of plasma electrons with concentration n (sub o) and an electron beam passing through the plasma at velocity V in the direction of one of the coordinate axes. The electron beam is assumed to be hot, and perturbations of the beam distribution in a self-consistent field are described by the Boltzmann equation. Integration of the perturbation function along trajectories with respect to velocity components, following the Fourier transform with respect to space coordinates, yields a simple criterion for plasma beam instability that does not include the initial width of the perturbing wave packet.

Author

N84-32106# Joint Publications Research Service, Arlington, Va.
HEAT TRANSFER BY RADIATION IN HYDROGEN PLASMA Abstract Only **c75**

G. A. Kovalskaya, V. G. Sevastyanenko, and R. I. Soloukhin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 83 Transl. into ENGLISH from Inzh.-Fiz. Zh. (Minsk), v. 45, no. 6, Dec. 1983 p 977-983 (For primary document see N84-32081 21-70)

Avail: NTIS HC A06/MF A01

Tables of partial intensities I (or Som) and Sim are presented for calculating the flux fields and the flux diversion fields in systems of any geometric form and with arbitrary pressure and temperature distribution. Radiation characteristics are calculated for heat transfer in systems containing hot hydrogen with arbitrary pressure distribution ranging from 0.1 to 30 bar and temperature ranging from room temperature to 20,000 K.

Author

N84-32107# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL EQUATIONS FOR MOVEMENT OF TRIAXIAL GYROSCOPIC STABILIZER ON MOVING BASE Abstract Only **c35**

V. S. Antonchik and I. I. Romanyuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 84 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astron. (Leningrad), no. 1, Jan. 1984 p 59-63 Original language document previously announced in IAA as A84-25614 (For primary document

see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

The equations of motion allow for the inertial forces of the gimbals, the elastic deformation of the gyroscope elements, and the lack of coincidence between the platform's center of inertia and the centers of inertia of the gyroscopes. Lagrange equations of the second kind are used, and the form taken by the forces of interaction between the elements of the stabilizer is indicated. In contrast to the study made by Afon'kin and Zimnitskii (1973), the full form of the differential equations of motion is given here.
C.R. (IAA)

N84-32108# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF NONLINEAR COMPRESSION PULSES THROUGH GRANULAR MEDIA Abstract Only c34
V. F. Nesterenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 87-88 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 136-148 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

Transient nonlinear perturbations and subsequent propagation of nonlinear compression pulses in a one-dimensional granular medium are analyzed on the basis of intergranular interaction in accordance with Hertz's law, this law being extendable from static to dynamic situations under three constraints: (1) the maximum stress reached at the center of a contact surface must not exceed the strength level; (2) the dimensions of a contact surface must be much smaller than the radii of curvature of individual grains; and (3) the characteristic time of perturbation and propagation must be much shorter than the period of oscillations of an elastic spherical grain in the fundamental mode. Results were obtained for several specific situations including: (1) row of grains free at both ends, with decay of initial perturbation; (2) collision of two unequal solitons, the one with smaller amplitude either opposing the other one or reaching the other one from behind; (3) motion of piston at constant velocity; and (4) external force with ramp profile.
B.G.

N84-32109# Joint Publications Research Service, Arlington, Va.
NON-INTEGRABILITY OF PLANAR OSCILLATION EQUATION FOR SATELLITE IN ELLIPTICAL ORBIT Abstract Only c13
A. A. Burov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 89-90 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat., Mekhan. (Moscow), no. 1, Jan. - Feb. 1984 p 71-73 Original language document previously announced in IAA as A84-27889 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

It is demonstrated that the equation of the plane oscillations of a satellite in an elliptical orbit does not have an analytic first integral for all values of the principal central moments of inertia A, B, C; A not equal to C. The method of proof is based on the classical ideas of Poincare.
B.J. (IAA)

N84-31451# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE CHARACTERISTICS OF RESONATORS WITH ARBITRARY DISTRIBUTION OF DIELECTRIC PERMITTIVITY Abstract only
A. S. Logginov and Yu. F. Yulberdin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 51 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 29-34 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04/MF A01

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-32110 Stanford Univ., Calif.
UNIFIED THEORY AND MEASUREMENTS OF ELASTIC WAVES IN POLYCRYSTALLINE MATERIALS Ph.D. Thesis
Fred E. Stanke 1984 189 p
Avail: Univ. Microfilms Order No. DA8408360

The fundamental tools for acoustic, quantitative evaluation of real polycrystalline materials are provided. Its unified theory for the propagation of elastic waves in polycrystalline solids is very general, and probably applicable to all one-phase media. It is valid for all frequencies and accounts for the complexities of mode conversion in elastic media. It avoids coherent artifacts by using a spatial autocorrelation function to describe the geometry of the grains. The algebraic and numerical solutions are rigorously applicable to macroscopically isotropic and homogeneous, one-phase materials with cubic-class crystallites. The autocorrelation function provides a new approach for characterizing grain size and is easily obtainable from micrographs of grains using standard measurement techniques. An analytical derivation based on the assumption that the crossings of grain boundaries on a line through the medium have Poisson statistics results in an inverse exponential form for the autocorrelation function.
Dissert. Abstr.

N84-32111 Pennsylvania State Univ., University Park.
ACOUSTIC PROPAGATION IN THE SURFACE LAYER UNDER CONVECTIVELY UNSTABLE CONDITIONS Ph.D. Thesis
S. David Roth 1983 208 p
Avail: Univ. Microfilms Order No. DA8409090

The effects of micrometeorological processes on acoustic propagation are examined. First, a review of the literature discussion our limited knowledge of the relationships between fluctuating acoustic signals and meteorological processes is presented. The relationships between turbulence on the convective scale and acoustic propagation is specifically discussed. A model is developed which demonstrates that the passage of thermal plumes, nominally considered turbulence, can cause sound level fluctuations on the order of 30 dB. Experiments were performed during convectively unstable conditions in an open field and within a forest. In order to properly characterize the sound propagation medium, the field studies include extensive micrometeorological instrumentation. Large fluctuations in sound level-associated with thermal plumes are shown to be characteristic of an open field environment. But forests are shown to significantly suppress the sound level variations. An acoustic descriptor is presented which can be used to parameterize thermal activity in the atmosphere. Propagation losses are also discussed in terms of use of a forest as a sound barrier.
Dissert. Abstr.

N84-32112 Rochester Univ., N. Y.
A SUPERCONDUCTING MICROWAVE PARAMETRIC CONVERTER TRANSDUCER SENSITIVE TO 10 TO THE MINUS NINETEENTH POWER m HARMONIC MOTION Ph.D. Thesis
Charles Edwin Reece 1984 152 p
Avail: Univ. Microfilms Order No. DA8409157

Toward the development of a transducer suitable for the detection of high frequency gravitational effects, a superconducting microwave coupled-cavity parametric converter transducer was analyzed, developed and tested. An analysis is presented of the intermodal parametric conversion which is produced by harmonic perturbation of the length of a 10 GHz TE(011) mode cylindrical resonant cavity. The converter is examined as a transducer of displacement with harmonic frequency near the intermodal difference frequency. Transducer sensitivity dependence upon cavity tunings, couplings, and Q-factors is analyzed and experimentally tested with excellent agreement. The transducer consists of two identical coupled TE(011) niobium cavities with one endwall driven into mechanical oscillation by an externally mounted piezoelectric ceramic. A displacement with effective amplitude (3.7 + or 1.3) x 10(-19) m and frequency 1.13 MHz was observed by detecting a 10GHz conversion power of 10(-2) watts. This measurement was obtained with 0.12 mj stored in a cavity resonance with an unloaded Q-factor of 6.7 x 10(8) at 1.55 K. The applications of this device in the detection of high frequency

gravitational effects are also discussed. Finally, the prospects for improvement of transducer sensitivity and the ultimate limitations are presented. Dissert. Abstr.

N84-32113 Colorado Univ., Boulder.
RESOLUTION AND QUANTITATIVE ACCURACY IMPROVEMENTS IN ULTRASOUND TRANSMISSION IMAGING Ph.D. Thesis
Thomas Leonard Chenevert 1983 137 p
Avail: Univ. Microfilms Order No. DA8408018

The type of ultrasound transmission imaging, referred to as ultrasonic computed tomography (UCT), reconstructs distributions of tissue speed of sound and sound attenuation properties from measurements of acoustic pulse time of flight (TCF) and energy received through tissue. Although clinical studies with experimental UCT scanners have demonstrated UCT is sensitive to certain tissue pathologies not easily detected with conventional ultrasound imaging, they have also shown UCT to suffer from artifacts due to physical differences between the acoustic beam and its ray model implicit in image reconstruction algorithms. Artifacts are expressed as large quantitative errors in attenuation images, and poor spatial resolution and size distortion (exaggerated size of high speed of sound regions) in speed of sound images. Methods are introduced and investigated which alleviate these problems in UCT imaging by providing improved measurements of pulse TCF and energy. Dissert. Abstr.

N84-32114 Stanford Univ., Calif.
THEORY OF ACOUSTIC SPECKLE Ph.D. Thesis
David Ingles Brubaker 1984 189 p
Avail: Univ. Microfilms Order No. DA8408260

Speckle is the name given to the mottled or speckled appearance often evidence in the displayed output of a coherent imaging system. Speckle results when the propagating wavefront has a spatial or temporal coherence length on the same order of magnitude as some distorting influence within the system. As this wavefront is being detected, phase cancellations due to the distorting influence will exist across the surface of the detector, causing both constructive and destructive interference. As a result, the displayed image will contain detail, the mottled texture previously mentioned, not existing in the actual imaged object. The basic random discrete scatterer model is extended in order to account for the wavefront aberration suffered during propagation through inhomogeneous media. Computer simulation results are presented which demonstrate the behavior of speckle characteristics in response to changing system parameters. Additionally, a means of determining the degree to which wave distortion contributes to the total speckle is presented and supported with computer simulations. Dissert. Abstr.

N84-32115*# Purdue Univ., Lafayette, Ind.
MEASUREMENT OF THE ABSORPTION COEFFICIENT USING THE SOUND-INTENSITY TECHNIQUE
Mahabir Atwal and Robert Bernhard May 1984 12 p ref
(Grant NAG1-58)
(NASA-CR-173848; NAS 1.26:173848; Rept-0226-9; HL84-12)
Avail: NTIS HC A02/MF A01 CSCL 20A

The possibility of using the sound intensity technique to measure the absorption coefficient of a material is investigated. This technique measures the absorption coefficient by measuring the intensity incident on the sample and the net intensity reflected by the sample. Results obtained by this technique are compared with the standard techniques of measuring the change in the reverberation time and the standing wave ratio in a tube, thereby, calculating the random incident and the normal incident adsorption coefficient. E.R.

N84-32116*# Purdue Univ., Lafayette, Ind.
STUDY OF DOUBLE WALL PANELS FOR USE IN PROPELLER DRIVEN AIRCRAFT
Mahabir Atwal and Robert Bernhard May 1984 24 p ref
(Grant NAG1-58)
(NASA-CR-173847; NAS 1.26:173847; Rept-0226-10; HL84-13)
Avail: NTIS HC A02/MF A01 CSCL 20A

Propeller driven aircraft have exhibited high levels of interior noise. Most absorption materials are not effective at low frequencies where maximum noise levels occur. Two panels separated by an air gap are suggested as an alternative means of noise attenuation. This design produces an impedance mismatch where a sound wave travels backwards to the source. The higher the impedance, the higher the reflected soundwave intensity. Two aluminum panels with helium in between and two panels with one being perforated were investigated. Helium increases the transmission loss because of a greater impedance mismatch than air. The transmission loss of the unperforated panel is higher throughout the frequency range tested. DOE

N84-32117*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
PREDICTION OF LIGHT AIRCRAFT INTERIOR SOUND PRESSURE LEVEL USING THE ROOM EQUATION
Mahabir Atwal and Robert Bernhard May 1984 25 p refs
(Grant NAG1-58)
(NASA-CR-173840; NAS 1.26:173840; Rept-0226-12; HL-84-15)
Avail: NTIS HC A02/MF A01 CSCL 20A

The room equation is investigated for predicting interior sound level. The method makes use of an acoustic power balance, by equating net power flow into the cabin volume to power dissipated within the cabin using the room equation. The sound power level transmitted through the panels was calculated by multiplying the measured space averaged transmitted intensity for each panel by its surface area. The sound pressure level was obtained by summing the mean square sound pressures radiated from each panel. The data obtained supported the room equation model in predicting the cabin interior sound pressure level. S.B.

N84-32118*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TIME DEPENDENT WAVE ENVELOPE FINITE DIFFERENCE ANALYSIS OF SOUND PROPAGATION
Kenneth J. Baumeister 1984 14 p refs Proposed for presentation at the 9th Aeroacoustics Conf., Williamsburg, Va., 15-17 Oct. 1984; sponsored by the American Inst. of Aeronautics and Astronautics (NASA-TM-83744; E-2233; NAS 1.15:83744) Avail: NTIS HC A02/MF A01 CSCL 20A

A transient finite difference wave envelope formulation is presented for sound propagation, without steady flow. Before the finite difference equations are formulated, the governing wave equation is first transformed to a form whose solution tends not to oscillate along the propagation direction. This transformation reduces the required number of grid points by an order of magnitude. Physically, the transformed pressure represents the amplitude of the conventional sound wave. The derivation for the wave envelope transient wave equation and appropriate boundary conditions are presented as well as the difference equations and stability requirements. To illustrate the method, example solutions are presented for sound propagation in a straight hard wall duct and in a two dimensional straight soft wall duct. The numerical results are in good agreement with exact analytical results. Author

N84-32119*# Cambridge Acoustical Associates, Inc., Mass.
ANALYTICAL MODEL OF THE STRUCTUREBORNE INTERIOR NOISE INDUCED BY A PROPELLER WAKE Final Report
M. C. Junger, J. M. Garrelick, R. Martinez, and J. E. Cole, III May 1984 98 p refs
(Contract NAS1-17570)
(NASA-CR-172381; NAS 1.26:172381) Avail: NTIS HC A05/MF A01 CSCL 20A

The structure-borne contribution to the interior noise that is induced by the propeller wake acting on the wing was studied. Analytical models were developed to describe each aspect of this path including the excitation loads, the wing and fuselage structures, and the interior acoustic space. The emphasis is on examining a variety of parameters, and as a result different models were developed to examine specific parameters. The excitation loading on the wing by the propeller wake is modeled by a distribution of

rotating potential vortices whose strength is related to the thrust per blade. The response of the wing to this loading is examined using beam models. A model of a beam structurally connected to a cylindrical shell with an internal acoustic fluid was developed to examine the coupling of energy from the wing to the interior space. The model of the acoustic space allows for arbitrary end conditions (e.g., rigid or vibrating end caps). Calculations are presented using these models to compare with a laboratory test configuration as well as for parameters of a prop-fan aircraft. A.R.H.

N84-32120*# Bionetics Corp., Hampton, Va.
ACOUSTIC TESTS OF THE MOD-0/5A WIND TURBINE ROTOR WITH TWO DIFFERENT AILERONS
Kevin P. Shepherd and Harvey H. Hubbard Aug. 1984 31 p refs Prepared in cooperation with the College of William and Mary
(Contract NAS1-16978; Grant NAG1-166)
(NASA-CR-172427; NAS 1.26:172427) Avail: NTIS HC A03/MF A01 CSCL 20A

The noise of a MOD-0 wind turbine generator rotor equipped with plain and balanced partial span ailerons for lift and drag control was measured. Data were obtained for a wide range of aileron deflection angles and for limited ranges of wind velocity and power output. Noise levels increased as deflection angles increased and were higher in the upwind than in the downwind direction. The plain aileron exhibited a howling noise in the frequency range 400-800 Hz at deflection angles for which flow induced cavity resonances were significant. Author

N84-32121*# Utah Univ., Salt Lake City. Dept. of Mechanical and Industrial Engineering.
ACOUSTIC PROPAGATION IN A TERMALLY STRATIFIED ATMOSPHERE Semiannual Report
W. K. vanMoorhem 23 Aug. 1984 57 p refs
(Grant NAG1-283)
(NASA-CR-173863; NAS 1.26:173863; UTEC-ME-84-075; SAR-4) Avail: NTIS HC A04/MF A01 CSCL 20A

This report describes the activities during the fourth six month period of the investigation of acoustic propagation in the atmosphere with a realistic lapse temperature profile. A significant error was detected since the previous semi-annual report and has been corrected in both the plane wave and point source solutions. This report then describes both of these problems in some detail along with presenting some numerical results from the model. Work will begin this summer on the model of propagation in an inversion. Author

N84-32122*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF THE EFFECT ON COMBUSTOR NOISE MEASUREMENTS OF ACOUSTIC WAVES REFLECTED BY THE TURBINE AND COMBUSTOR INLET
Ronald G. Huff 1984 14 p refs Presented at the 9th Aeroacoustics Conf., Williamsburg, Va., 15-17 Oct. 1984; sponsored by NASA and AIAA
(NASA-TM-83760; E-2250; NAS 1.15:83760) Avail: NTIS HC A02/MF A01 CSCL 20A

Spectral analyses of static pressure fluctuations measured in turbine engine combustors at low engine speed show good agreement with theory. At idle speed the high pressure turbine is unchoked. Above idle speed the turbine chokes and a significant change in the shape of the measured combustor pressure spectrum is observed. A simplified theoretical model of the acoustic pressure generated in the combustor due to the turbulence-flame front interaction did not account for acoustic waves reflected from the turbine. By retaining this simplified combustion noise source model and adding a partial reflecting plane at the turbine and combustor inlet, a simple theoretical model was developed that reproduces the undulations in the combustor fluctuating pressure spectra. Plots of the theoretical combustor fluctuating pressure spectra are compared to the measured pressure spectra obtained from the CF6-50 turbofan engine over a range of engine operating speeds. The simplified combustion noise theory when modified by a simple turbine reflecting plane adequately accounts for the changes in measured combustor pressure spectra. It is further concluded that the shape of the pressure spectra downstream of the turbine, neglecting noise generated by the turbine itself, will be the combustion noise spectra unchanged except for the level reduction due to the energy blocked by the turbine. Author

N84-32123*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
ANALYTICAL INVESTIGATION OF SYNCHROPHASING AS A MEANS OF REDUCING AIRCRAFT INTERIOR NOISE Final Report
C. R. Fuller Washington NASA Aug. 1984 42 p refs
(Grant NAG1-390)
(NASA-CR-3823; NAS 1.26:3823) Avail: NTIS HC A03/MF A01 CSCL 20A

The noise control characteristics of synchrophasing are investigated using a simplified model of an aircraft fuselage. The analysis presented here includes directivity effects of the noise sources and solves in closed form the coupled motion between the interior and exterior acoustic fields and the shell vibrational response. The variation in sound pressure level at various locations inside the shell is studied for various synchrophase angles as well as the shell vibrational response and input power flow in order to uncover the principal mechanisms behind the transmission phenomena. Author

N84-32124*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANNOYANCE CAUSED BY PROPELLER AIRPLANE FLYOVER NOISE
David A. McCurdy and Clemans A. Powell Aug. 1984 52 p refs
(NASA-TP-2356; L-15796; NAS 1.60:2356) Avail: NTIS HC A04/MF A01 CSCL 20A

Laboratory experiments were conducted to provide information on quantifying the annoyance response of people to propeller airplane noise. The items of interest were current noise metrics, tone corrections, duration corrections, critical band corrections, and the effects of engine type, operation type, maximum takeoff weight, blade passage frequency, and blade tip speed. In each experiment, 64 subjects judged the annoyance of recordings of propeller and jet airplane operations presented at d-weighted sound pressure levels of 70, 80, and 90 dB in a testing room which simulates the outdoor acoustic environment. The first experiment examined 11 propeller airplanes with maximum takeoff weights greater than or equal to 5700 kg. The second experiment examined 14 propeller airplanes weighting 5700 kg or less. Five jet airplanes were included in each experiment. For both the heavy and light propeller airplanes, perceived noise level and perceived level (Stevens Mark VII procedure) predicted annoyance better than other current noise metrics. Author

N84-32125# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
MICROMETRIC CLEANING OF STEEL TUBES THROUGH ULTRASONIC CAVITATION
L. X. Nepomuceno 6 Aug. 1984 8 p In PORTUGUESE; ENGLISH summary
(Rept-61584) Avail: NTIS HC A02/MF A01

A series of 0.8 mm Inox steel tubes were clean so that no debris with dimensions equal to or greater than 0.1 micrometers remained. The gas flow into the tubulation is used in spectrophotometric analysis of engine exhaust gases to attain the mentioned values. The piping presented lengths between 17 and 20 meters, with many bends and curves, making impossible an ultrasonic cleaning by the classical methods. The problem was solved by sending a continuous flow of isopropyl alcohol through the piping and applying high energy ultrasonic vibration in the outer surface of the pipes while the solvent flows. After the cleaning, the filters used were observed in a microscope, showing no debris outside the specified range. B.G.

N84-32126# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
AGGLOMERATION AND PECIPITATION BY SONIC-INERTIAL

MEANS: ABSTRACT OF THE STATE OF THE ART
L. X. Nepomuceno 5 Jul. 1984 69 p refs In PORTUGUESE; ENGLISH summary
(Rept-0563/84) Avail: NTIS HC A04/MF A01

Acoustic - intertial precipitation and agglomeration of aerosols are discussed. Evidence suggests that this sonic-inertial method is applicable when the gases involved derive from pyrolysis in chambers. A pilot model is proposed that supplies the necessary detailed data for the design and construction of an industrial model for large capacity. Author

N84-32127# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE DISCRIMINATION OF PITCH IN PULSE TRAINS AND SPEECH
M. A. Mack and B. Gold 12 Apr. 1984 34 p
(Contract F19628-80-C-0002)
(AD-A142996; TR-680; ESD-TR-84-013) Avail: NTIS HC A03/MF A01 CSCL 17/2

Much research has been conducted on the discrimination of pure and complex tones. Yet relatively little work has been carried out on the discrimination of pitch in speech. Thus, the present experiment was designed to explore listener's ability to discriminate the pitch to three types of acoustically complex stimuli - pulse trains with monotone pitch, vocoded speech with monotone pitch, and vocoded speech with natural pitch. Results revealed that the discrimination of naturally intoned sentences was worse than that of the pulse trains or monotone sentences. Implications for speech synthesis and processing are discussed. Author (GRA)

N84-32128# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF 2 ACOUSTIC PARABOLIC TRANSMISSION LOSS MODELS FOR COMPATIBILITY WITH THE WAVE-NUMBER TECHNIQUE IN THE DETERMINATION OF SOURCE DEPTH M.S. Thesis
J. L. Blanchard, II Mar. 1984 152 p
(AD-A143079) Avail: NTIS HC A08/MF A01 CSCL 20/1

The Brock version of the Split-Step Fast Fourier Transform (SSFFT) and the Jeager version of the Implicit Finite Difference (IFD) acoustic parabolic equation models are compared with a Lloyd mirror interference pattern in the range domain. The SSFFT displays the inability to place the transmission loss nulls at the correct ranges. It is also unable to utilize bottom loss information correctly. The IFD produced nulls at the correct ranges; however, it inserted an unacceptable amount of noise except when small (1 m) vertical grid steps were used and the pressure release bottom was placed at extended depths. In shallow water cases, the IFD is able to properly represent the pressure information. Each model is explored in the wavenumber domain by use of a Wavenumber Technique (WT) model with emphasis on source depth determination. The source depth may be determined by measuring the distance between the equally spaced nulls in the wavenumber representation. GRA

N84-31449# Joint Publications Research Service, Arlington, Va.
ALTERNATING ACOUSTOELECTRIC CURRENT GENERATED BY INTERACTION OF TWO WAVES IN ACOUSTIC MICROWAVEGUIDE Abstract only
G. I. Bulakh and I. V. Ostrovskiy *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 83-85 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 1, Jan. 1984 p 83-85 Document announced as A84-22564 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-32044# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF ACOUSTIC PROPERTIES OF SOUND ABSORBING FIBROUS MATERIALS ON THEIR STRUCTURE Abstract Only
N. N. Voronina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 8 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 29, no. 5, Sep. - Oct. 1983 p 598-602 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32045# Joint Publications Research Service, Arlington, Va.
PARAMETRIC EXCITATION OF TRANSVERSE ACOUSTIC SLOT WAVES IN SOLIDS BY MEANS OF MICROWAVE ELECTRIC FIELD Abstract Only
T. I. Bondarenko and G. N. Burlak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 9 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 1, Jan. - Feb. 1984 p 132-134 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32048# Joint Publications Research Service, Arlington, Va.
SOUND FIELD OF TURBULENT WAKE Abstract Only
L. M. Lamshev and A. T. Skvortsov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 15 Transl. into ENGLISH from Pisma Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 24, 26 Dec. 1983 p 1506-1510 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-32129 Stanford Univ., Calif.
GENERATION AND APPLICATION OF FINELY FOCUSED LOW ENERGY ELECTRON BEAMS Ph.D. Thesis
You-Wen Yau 1984 137 p refs
Avail: Univ. Microfilms Order No. DA8408381

Submicron diameter beams of low energy (5 keV or less) electrons are desirable for a number of applications such as high resolution lithography with negligible proximity effects and selective surface heating of targets. Focusing low energy electrons in conventional electron beam systems is usually hampered by chromatic aberration and spherical aberration of the final lens and by electron-electron interactions since the electrons are slower. An alternative approach is to accelerate the electrons to a high potential (e.g., 20 keV) initially and then reduce the potential only near the target. Two configurations were investigated numerically and experimentally. Such retarding field configurations have the advantages of much lower aberrations and reduced electron-electron interactions, thus faciltating the production of low energy electron beams without seriously sacrificing current density. With such finely focused low energy electron beams, the power dissipated per unit volume near the surface of the bulk target is higher because of the larger scattering cross-section of the lower energy electrons. This increases the speed (in square centimeter per Coulomb) of exposure of (thin) resists and renders proximity and heating effects negligible. Dissert. Abstr.

N84-32130*# Nebraska Univ., Lincoln. Lab. of Physics.
ABSOLUTE PHOTOIONIZATION CROSS SECTIONS OF ATOMIC OXYGEN
James A. R. Samson and P. N. Pareek [1982] 29 p refs
(Grant NGR-28-002-021)
(NASA-CR-173873; NAS 1.26:173873) Avail: NTIS HC A03/MF A01 CSCL 20H

The absolute values of photoionization cross sections of atomic oxygen were measured from the ionization threshold to 120 A. An auto-ionizing resonance belonging to the 2S2P4(4P)3P (3Do, 3So) transition was observed at 479.43 A and another line at 389.97 A. The experimental data is in excellent agreement with rigorous close-coupling calculations that include electron correlations in both the initial and final states. Author

N84-32131*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTICAL STARK EFFECT IN THE 2-PHOTON SPECTRUM OF NO
Winifred M. Huo (Notre Dame Univ., Ind.), Kenneth P. Gross (Stanford Univ., Calif.), and Robert L. McKenzie Jul. 1984 20 p refs

(NASA-TM-85964; A-9760; NAS 1.15:85964) Avail: NTIS HC A02/MF A01 CSCL 20H

A large optical Stark effect has been observed in the two-photon spectrum X(2)Pi yields A(2)Sigma(+)— in NO. It is explained as a near-resonant process in which the upper state of the two-photon transition is perturbed by interactions with higher-lying electronic states coupled by the laser field. A theoretical analysis is presented along with coupling parameters determined from ab initio wave functions. The synthetic spectrum reproduces the major experimental features. M.G.

N84-32132# Naval Research Lab., Washington, D. C.

LONGITUDINAL AND TRANSVERSE INSTABILITIES IN A HIGH CURRENT MODIFIED BETATRON ELECTRON ACCELERATOR Interim Report

P. Sprangle and J. L. Vomvoridis 17 May 1984 25 p

(AD-A142822; AD-E000571; NRL-MR-4688) Avail: NTIS HC A02/MF A01 CSCL 20/7

In this paper we derive a general dispersion relation which describes the longitudinal and transverse instabilities on an intense non-neutral electron beam in a modified betatron field configuration. In a modified betatron, the usual betatron fields are supplemented by a strong toroidal stabilizing magnetic field. The negative mass kink, longitudinal resistive wall and transverse resistive wall instabilities have been analyzed in the new field configuration for an intense, non-neutral, confined electron ring. Our model includes self field effects as well as induced field effects due to the image charges and currents on the toroidal chamber walls. The electron ring, which is assumed to have an energy spread, is taken to be located near the center of a toroidal chamber of finite conductivity. All the instabilities examined here are shown to significantly reduced by the presence of the strong toroidal magnetic field. In the limit of low beam current and no toroidal magnetic field our results reduce to the usual expressions. We find an unstable hybrid mode of oscillation which is a coupled azimuthal and longitudinal mode and exists at beam energies below the transition energy. The negative mass kink instability associated with an ultra high current (approximately 10 kA) modified betatron electron accelerator is analyzed and evaluated in some detail. Growth rate curves are given for various ranges of system parameters, including electron beam energy spread. It is found that with a moderate energy spread on a 10 kA injected electron beam, the negative mass kink instability can be stabilized. GRA

N84-32133# National Bureau of Standards, Washington, D.C. National Measurement Lab.

TRIPLY DIFFERENTIAL STUDIES OF ATOMIC AND MOLECULAR PHOTOIONIZATION USING SYNCHROTRON RADIATION Annual Summary Report, 1 Oct. 1983 - 30 Sep. 1984

A. C. Parr and J. L. Dehmer (Argonne National Lab.) 3 Jul. 1984 16 p

(Contract N00014-84-F-0005; RR0-1103)

(AD-A142834) Avail: NTIS HC A02/MF A01 CSCL 07/4

Basic studies of photoionization processes in atoms and molecules have been carried out using triply differential (differential in incident wavelength, ejected electron energy, and ejection angle) photoelectron spectroscopy with synchrotron radiation as the excitation source. Measurements have been conducted in the vacuum ultraviolet wavelength range up to H(Nu) about 35 eV on a variety of atomic and molecular systems. Photoelectron branching ratios (partial photoionization cross sections) and photoelectron angular distributions were obtained for all accessible states. Publications on C2N2, SO2, HCN, CH3CN, and BF3 were published or submitted for publication during the last year. The work on BF3 included extensive comparison with theoretical calculations, which revealed unexpected aspects of the dynamics of shape resonances in molecular photoionization. During the last year, the main effort has been placed on completion of a major new instrument for these studies. GRA

N84-32134# Cambridge Univ. (England).

MICROWAVE AND FAR INFRARED SPECTROSCOPY OF TRANSIENT MOLECULES Technical Report, 9-11 Apr. 1984

P. B. Davies 11 Apr. 1984 37 p

(AD-A142962) Avail: NTIS HC A03/MF A01 CSCL 07/4

Proceedings of the British Radio frequency Spectroscopy Group Spring Meeting 1984 are presented. Subject matter covered includes: Partial Contents: Molecular Beam Spectroscopy; D-Nuclear Quadrupole Coupling in Weakly Bound Dimers from Pulsed-Nozzle, Fourier Transform Microwave Spectroscopy; Spectroscopy of Radicals in Molecular Beams; Electric Dipole Moments of Alkaline Earth Monohalides; Microwave Spectroscopy of Free Radicals and Ions; Millimeter Submillimeter Studies of Free Radicals and Molecular Ions; Microwave Studies of Molecules of Chemical, Theoretical and Astrophysical Interest; High Resolution Spectroscopy and Structure of XO2, XSO and CH2X Molecules; The Rotational Energy Levels of CH, SiH and GeH; and Far Infrared Laser Magnetic Resonance. GRA

N84-32135# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.

CERENKOV RADIATION IN THE NEIGHBORHOOD OF THE EMISSION THRESHOLD

F. R. Buskirk and J. R. Neighbours May 1984 9 p

(AD-A143088; NPS61-84-007) Avail: NTIS HC A02/MF A01 CSCL 20/10

Cerenkov radiation for constant velocity electrons in an infinite uniform dielectric has a sharp threshold for v (electron) larger than the speed of light in the dielectric. A medium of finite length produces diffraction which smears the Cerenkov emission angle and lowers the threshold velocity for emission. Author (GRA)

N84-32136# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.

MEASUREMENT OF LINAC BUNCH PARAMETERS USING THE CERENKOV EFFECT

F. R. Buskirk and J. R. Neighbours May 1984 21 p

(RR0-0001)

(AD-A143128; NPS61-84-008) Avail: NTIS HC A02/MF A01 CSCL 20/8

High energy electrons above about 25 MeV may produce microwave radiation in air by the Cerenkov mechanism. Electrons accelerated by a travelling wave accelerator are emitted in bunches. The radiation produced by such a beam in air should consist of the basic accelerator frequency and many harmonics. Here it is explored how the microwave harmonics may be used to determine the spatial structure of the bunches. Author (GRA)

N84-32137# California Univ., Livermore. Lawrence Livermore Lab.

SCATTERING OPTICAL ACTIVITY OF CHIRAL MOLECULES: CIRCULAR INTENSITY DIFFERENTIAL SCATTERING AND CIRCULAR DIFFERENTIAL IMAGING Ph.D. Thesis

D. J. Keller Feb. 1984 253 p refs

(Contracts DE-AC03-76SF-00098; DE-AT03-60090)

(DE84-010712; LBL-17472) Avail: NTIS HC A11/MF A01

Theoretical treatments are presented for two new techniques based on the ability of chiral molecules to preferentially scatter or absorb right and left circularly polarized light: circular intensity differential scattering (CIDS) and circular differential imaging (CDI). For CIDS, a theory is presented based on classical electrodynamics for scattering in the second Born approximation. The extension of the CIDS theory to the second Born approximation has resulted in new behavior for forward scattered light and systems of isotropic scatterers. Next, a quantum mechanical theory for CIDS is presented. For CDI a theory is presented, based in part on the classical theory for CIDS mentioned above. Two types of differential images are possible: (1) darkfield images formed from light reflected or scattered by the sample, and (2) brightfield images formed from light transmitted through the sample. The sign and magnitude of each feature in a circular differential image are proportional to the optical activity of the corresponding feature in the sample. DOE

N84-32138# California Univ., Berkeley. Lawrence Berkeley Lab.

BEAM EXPERIMENT PROGRAMS IN THE USA

Charles Kim Mar. 1984 6 p refs Presented at the Intern. Symp. on Heavy Ion Accelerators and Their Appl. to Intertial Fusion, Tokyo, 23 Jan. 1984
(Contract DE-AC03-76SF-00098)
(DE84-010804; LBL-17561; CONF-840142-8) Avail: NTIS HC A02/MF A01

Three beam transport experiments at Brookhaven National Laboratory, Lawrence Berkeley Laboratory, and Maryland University, are briefly discussed. Kinetic energies, pulse duration, focussing schemes, number of lattice periods, period lengths, and aperture radius are given for each facility. It was demonstrated that an intense beam with the space charge defocussing force as large as the average focussing forces of the channel can be transported over many lattice periods without losing either the current or the optical quality. This is an important implication in designing a linear induction accelerator driver for inertial confinement fusion. DOE

N84-32139# Los Alamos Scientific Lab., N. Mex.
RESONANCES IN ELECTRON-MOLECULE SCATTERING AND PHOTOIONIZATION
B. I. Schneider and L. A. Collins May 1984 20 p refs Presented at the Ann. APS Division of Electron and Atomic Physics Meeting, Storrs, Conn., 29-31 May 1984
(Contract W-7405-eng-36)
(DE84-012660; LA-UR-84-1424; CONF-8405177-1) Avail: NTIS HC A02/MF A01

The development of reliable theoretical models for calculating the decay of quasi-stationary states of molecular systems has become an important endeaver for theoretical chemists. The understanding and analysis of a wide variety of physical and chemical phenomena depend on a knowledge of the behavior of these states in both collisional and photoionization problems. The theory and calculation of these cross sections are described using the Linear Algebraic/Optical Potential method. The theory makes optimal use of the numerical methods developed to solve large sets of coupled integral equations and the bound state techniques used by quantum chemists. Calculations are presented for a representative class of diatomic and triatomic molecules at varying levels of sophistication and for collisional and photoionization cross sections. Author

N84-32140# Fermi National Accelerator Lab., Batavia, Ill.
MODERN CONTROL TECHNIQUES FOR ACCELERATORS
R. W. Goodwin and M. F. Shea May 1984 9 p Presented at the 10th Intern. Conf. on Cyclotrons and their Appl., East Lansing, Mich., 30 Apr. - 3 May 1984
(Contract DE-AC02-76CH-03000)
(DE84-012521; FERMILAB/TM-1261; CONF-8404143-5) Avail: NTIS HC A02/MF A01

Beginning in the mid to late sixties, most new accelerators were designed to include computer based control systems. Although each installation differed in detail, the technology of the sixties and early to aid seventies dictated an architecture that was essentially the same for the control systems of the era. A minicomputer was connected to the hardware and to a console. Two developments have changed the architecture of modern systems: (a) the microprocessor and (b) local area networks. These two developments and their impact on control system design and implementation by way of describing a possible architecture for any size of accelerator are described. Both hardware and software aspects are included. DOE

N84-32141# Stanford Linear Accelerator Center, Calif.
USING IONS TO PROBE THE TRANSVERSE SIZE OF A BUNCH
J. Rees May 1984 9 p refs
(Contract DE-AC03-76SF-00515)
(DE84-012772; SU-SLAC/AP-24) Avail: NTIS HC A02/MF A01

The electric field carried along by a SLC bunch in very intense at the surface of the bunch because of the bunch's tiny transverse dimensions and its high charge density. For a given bunch population, the maximum electric field - which occurs at the surface - is inversely proportional to the bunch radius for a round bunch. The smaller the radius, the higher the peak field. A charged particle such as an ion or an electron which is placed at rest in the path of the oncoming bunch will be accelerated by the field as the bunch has passed having sampled the field of the bunch. Thus by placing a swarm of stationary charged particles in the path of the bunch and measuring their momentum distribution when they emerge, the bunch's transverse size can be inferred. The terms size and surface are used in a qualitative way, of course, expecting that their meaning will be reasonably clear to the reader. In the calculations a cylindrical model for the bunch is used in which their meanings are precise. DOE

N84-32142# Pacific Northwest Lab., Richland, Wash.
ALGORITHM FOR SECONDARY ELECTRON EMISSION FROM WATER VAPOR BY HIGH VELOCITY IONS
W. E. Wilson and J. H. Miller Apr. 1984 16 p refs Presented at 32nd Ann. Sci. Meeting of Radiation Res. Soc., Orlando, Fla., 1 Mar. 1984
(Contract DE-AC06-76RL-01830)
(DE84-011871; PNL-SA-11768; CONF-8403123-1) Avail: NTIS HC A02/MF A01

An algorithm is presented for calculating the cross section, differential in secondary electron energy, for ionization of water vapor by fast bare nonrelativistic ions. The algorithm is based on Bethe-theory which describes inelastic scattering as a sum of glancing and hard collisions. Published data were employed to evaluate the two components. The algorithm is written in FORTRAN-77. DOE

N84-32143# Stanford Linear Accelerator Center, Calif.
ENGINEERING BASIS FOR SELECTION OF POSITRON SOURCE MATERIAL
B. Feerick 10 Oct. 1983 14 p refs
(Contract DE-AC03-76SF-00515)
(DE84-011772; SU-SLAC-CN-250) Avail: NTIS HC A02/MF A01

The engineering basis for the selection of the positron source material is described. It assumes the approximate physics parameters were already (i.e., a high Z material of six radiation lengths thickness). A basic heat transfer analysis of the target was performed and is discussed. It is concluded that tantalum-10 tungsten is the most likely material to meet required physics parameters and not fail structurally. DOE

N84-32144# Sandia Labs., Albuquerque, N. Mex.
APC-2: AN ELECTRON BEAM PROPAGATION CODE
D. C. Iwan and J. R. Freeman May 1984 35 p refs
(Contract DE-AC04-76DP-00789)
(DE84-011532; SAND-84-0117) Avail: NTIS HC A03/MF A01

The computer code APC-2 simulates the propagation of a relativistic electron beam through air. APC-II is an updated version of the APC envelope model code which incorporates an improved conductivity model significantly extending the range of stable calculations. A number of test cases show that these new models are capable of reproducing the simulations reprogramming of the code, APC-2 is now friendly to both the occasional user and the experienced user who wishes to make modifications. Most of the code is in standard ANS-2 FORTRAN-77 so that it can be easily transported between machines. DOE

N84-32145# Brookhaven National Lab., Upton, N. Y.
DESIGN FABRICATION AND TESTING OF THE BNL RADIO FREQUENCY QUADRUPOLE ACCELERATOR
H. Brown, T. Clifford, S. Giordano, F. Khiari, R. Mckenzie-Wilson, M. Puglisi, and P. Warner 1984 4 p refs Presented at Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-011915; BNL-34706; CONF-840529-25) Avail: NTIS HC A02/MF A01

The Brookhaven National Laboratory polarized H(-) injection program for the AGS utilizes a Radio Frequency Quadrupole Accelerator for acceleration between the polarized source and

the Alvarez Linac. Although operation has commenced with a few micron amperes of H(-) beam, it is anticipated that future polarized H(-) sources will have a considerably improved output. The RFQ will operate at 201.25 MHz and will be capable of handling a beam current of 0.02 amperes with a duty cycle of 0.25%. The resulting low average power has allowed novel solutions to the problems of vane alignment, RF current contacts, and removal of heat from the vanes. The design philosophy, details of cavity fabrication, and vane machining will be discussed. Results of low and high power RF testing will be presented together with the initial results of operations in the polarized H(-) beam line. DOE

N84-32146# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROMAGNETIC DISSOCIATION OF RADIOACTIVE HEAVY-ION BEAMS
B. L. Berman Apr. 1984 6 p refs Presented at the Workshop on Prospects for Res. with Radioactive Beams from Heavy-Ion Accelerations, Washington, D.C., 26-27 Apr. 1984
(Contract W-7405-eng-48)
(DE84-012266; UCRL-90708; CONF-8404154-1) Avail: NTIS HC A02/MF A01

Based on experience with electromagnetic dissociation of relativistic stable ions, we discuss the prospects for experiments with beams of relativistic radioactive heavy ions. DOE

N84-32147# Wisconsin Univ., Madison. Dept. of Physics.
OPTICALLY PUMPED POLARIZED ALKALI ATOMIC BEAMS AND TARGETS
L. W. Anderson 1984 28 p refs
(Contract DE-AC02-81ER-40001)
(DE84-012389; DOE/ER-40001/T2) Avail: NTIS HC A03/MF A01

The optical pumping of (23)Na and (6)Li atomic beams is discussed. Experiments on the optical pumping of (23)Na atomic beams using either a single mode dye laser followed by a double passed acousto-optic modulator or a multimode dye laser are reported. The optical pumping of a (23)Na vapor target for use in a polarized H(-) ion source is discussed. Results on the use of viton as a wall coating with a long relaxation time are reported. DOE

N84-32148# State Univ. of New York, Binghamton. Dept. of Physics.
USUAL INITIAL AND FINAL STATE EFFECTS IN QUANTUM CHROMODYNAMICS Progress Report
Charles A. Nelson Mar. 1984 6 p
(Contract DE-AC02-83ER-40108)
(DE84-010422; DOE/ER-40108/1) Avail: NTIS HC A02/MF A01

Unlike soft initial degenerate states, the KLN theorem suggests that there will be a singular, if not a finite, contribution to the nonsinglet structure function arising from initial collinear and soft degenerate states. The notion of double cut diagrams is extended so as to evaluate the contribution from these states to the operator matrix elements and thereby are able to use the renormalization group equation in extracting the nonsinglet coefficient function. This introduces in a practical context a degenerate state concept for the basic partons. In two preprints, the theta theta parity test is generalized to any specific X (YIELDS) V1V2 decay mode where the vector mesons V1 and V2 each decays into two spin zero bosons. From a strong V1V2 mode with a V1 in equilibrium V2 exchange property, the parity eta of X can always be determined. For weak VV or V anti V channels, the CP eigenvalue of the decaying X can be determined which means that a Higgs boson can be simply distinguished from a technipion. DOE

N84-32149# Stanford Linear Accelerator Center, Calif.
FURTHER EFFECTS OF IONS IN THE ARCS
J. R. Rees 17 Aug. 1983 2 p
(Contract DE-AC03-76SF-00515)
(DE84-011761; SU-SLAC-CN-243) Avail: NTIS HC A02/MF A01

One of the effects of ions in the SLC arcs was considered by A.W. Chao in CN-121. The extra betatron phase shift of particles in the tail of a bunch caused by ions produced by the head was probably tolerable, provided the vacuum was 10(-4) torr or better. This note suggests that a more thorough study of ion effects in the arcs is warranted. DOE

N84-32150# Oak Ridge National Lab., Tenn.
PHYSICS OF ION SPUTTERING
M. T. Robinson Apr. 1984 10 p refs Presented at the 2nd Symp. on Resonance Ionization Spectry. and its Appl., Knoxville, Tenn., 16 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE84-011664; CONF-840449-3) Avail: NTIS HC A02/MF A01

The ejection of atoms by the ion bombardment of solids is discussed in terms of linear collision cascade theory. A simple argument describes the energies of the ejecta, but elaborate models are required to obtain accurate sputtering yields and related quantities. These incude transport theoretical models based on linearized Boltzmann equations, computer simulation models based on the binary collision approximation, and classical many-body dynamical models. The role of each kind of model is discussed. Several aspects of sputtering are illustrated by results from the simulation code MARLOWE. DOE

N84-32151# Oak Ridge National Lab., Tenn.
DUAL ARC PENNING ION SOURCE GAS FLOW EXPERIMENTS
E. D. Hudson, R. S. Lord, M. L. Mallory (Michigan State Univ.), and T. A. Antaya (Michigan State Univ.) 1984 3 p refs Presented at the 10th Intern. Conf. On Cyclotrons and their Appl., East Lansing, Mich., 30 Apr. - 3 May 1984
(Contract DE-AC05-84OR-21400)
(DE84-011637; CONF-8404143-3) Avail: NTIS HC A02/MF A01

Support gas, when added directly to an arc or admitted to an auxiliary chamber of a two-arc chamber ion source, increases the beam intensity for multicharged ions such as (16)O(5+). To clarify the mechanism of this intensity increase, gas flow rates from the auxiliary chamber to the main chamber were measured by using the ORIC cyclotron as a mass spectrometer. The results show that only about three percent of the gas admitted to the auxiliary chamber reaches the main chamber. One can then infer that the improved operation probably results from the stabilizing effect of heating the common cathodes with the auxiliary arc and/or the more favorable distribution of the support gas to the part of the main arc close to the cathodes. DOE

N84-32152# Stanford Linear Accelerator Center, Calif.
APPLIED CHROMODYNAMICS
Stanley J. Brodsky Nov. 1983 34 p refs Presented at the 23rd Cracow School of Theoretical Phys. Fundamental Interactions and Struct. of Matter, Zakopane, Poland, 29 May - 11 Jun. 1983 Submitted for publication
(Contract DE-AC03-76SF-00515)
(DE84-009136; SU-SLAC-Pub-3263; CONF-8305187-2) Avail: NTIS HC A03/MF A01

A number of features of Quantum ChromoDynamics (QCD) are reviewed, including the consequences of formation zone and color transparency phenomena in hadronic collisions, the use of automatic scale setting for perturbative predictions, null zone phenomena as a fundamental test of gauge theory, and the relationship of intrinsic heavy colored particle Fock state components to new particle production. A review of the applications of QCD to nuclear multiquark systems is presented. DOE

N84-32153# Columbia Univ., New York. Dept. of Physics.
THEORETICAL HIGH ENERGY PHYSICS Progress Report, 1 May 1983 - 30 Apr. 1984
T. D. Lee May 1984 22 p
(Contract DE-AC02-76ER-02271)
(DE84-011854; DOE/ER-02271/107; COO-2271-107) Avail: NTIS HC A02/MF A01

Research is described on lattice gauge theory, in particular the design and construction of an array of special purpose processors for carrying out large scale Monte Carlo simulations of

lattice QCD. Two prototype processors were constructed and the design optimized for the gauge theory calculations of interest. The detailed study of the pure SU(3) specific heat in the transition region between the strong and weak coupling limits using their original matrix multiplier and a PDP 11/34 is described. Results, based on 100,000 sweeps on a 6(4) lattice, show no increase in height of the sharp peak found a year ago for a 4(4) lattice. This indicates that this structure does not correspond to a higher order phase transition. Also, progress is reported on a thesis project: a Monte Carlo study of the Abbott-Farhi model. This is a strong-coupling model of the standard Weinberg-Salam weak interaction theory whose properties can at present only be determined using numerical lattice gauge theory methods. DOE

N84-32154# Argonne National Lab., Ill.
CONCEPT OF A SUPERCONDUCTING LINAC FOR LOW-VELOCITY IONS
L. M. Bollinger and K. W. Shepard May 1984 4 p refs Presented at the Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7 May 1984
(Contract W-31-109-eng-38)
(DE84-011740; CONF-840529-32) Avail: NTIS HC A02/MF A01

A very low velocity superconducting heavy-ion linac is proposed which, at least for applications requiring modest beam current, seems to have substantial cost and performance advantages over existing low-velocity room-temperature structures. The proposed linac, together with a 350 kV positive ion source, would replace an FN tandem Van de Graaff accelerator as the injector of the Argonne superconducting heavy-ion linac. DOE

N84-32155# Sandia Labs., Albuquerque, N. Mex. Simulation Technology Research.
PIXE AND PBFA 2: PULSED X-RAY SOURCE FEASIBILITY STUDY
Thomas W. L. Sanford Apr. 1984 84 p refs
(Contract DE-AC04-76DP-00789)
(DE84-011535; SAND-83-0838) Avail: NTIS HC A05/MF A01

The feasibility of PIXE (Proton Induced X-Ray Emission) radiation as an intense source of K, L, and M-shell X-rays is explored using PBFA-II as 2 to 40 MeV, multi-MA proton source. Because the peak of the characteristic X-ray production cross sections lie in the multi-MeV range for protons, PBFA-II, when optimized for maximum proton current, should be an ideal source. However, the efficiency for converting the proton energy to characteristic X-ray energy in the target is only of the order of 0.1 and is strongly dependent on target material. Furthermore, the emission of these low-energy X-rays from the target is dominated by absorption in the target. Two simple target designs have been considered that enables about 20 of the X-rays generated in the target to reach an area outside the target that is to be irradiated. One design which employs high magnetic-fields suffers from complications arising from the fields; the other design employs a tilted target and suffers from proton contamination at the area to be irradiated. Owing to the high efficiency possible with the tilted target, it is discussed in detail. Depending on the proton energy and the target material, surface doses up to a few hundred cal/gm over 500 sq cm are possible using PBFA-II. Because to the low energy of the X-rays, however, the fluence is only of the order of 0.2 cal/sq cm for all the targets considered. DOE

N84-32156# Stanford Linear Accelerator Center, Calif.
PHASE AND AMPLITUDE CONTROL SYSTEM FOR STANFORD LINEAR ACCELERATOR
S. J. Yoo 26 Sep. 1983 92 p
(Contract DE-AC03-76SF-00515)
(DE84-011773; SU-SLAC-CN-249) Avail: NTIS HC A05/MF A01

The computer controlled phase and amplitude detection system measures the instantaneous phase and amplitude of a 1 microsecond 2856 MHz RF pulse at a 180 Hz rate. This is used for phase feedback control, and also for phase and amplitude jitter measurement. The program is modified to improve the function of the system. The software algorithms used in the measurement are described, as is the performance of the prototype phase and amplitude detector system. DOE

N84-32157# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
FUTURE ACCELERATORS USING MICRO-FABRICATION TECHNOLOGY
A. W. Maschke 1983 2 p Presented at the 12th Intern. Conf. on High Energy Accelerators, Batavia, Ill., 11-16 Aug. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002692; BNL-33749; CONF-830822-51) Avail: NTIS HC A02/MF A01

Accelerators in the range of 1000 TeV are studied. The radiation loss in a circular machine would correspond to approximately 20 TeV/turn. It is clear then that the future generation of accelerators will have to be linear accelerators. Furthermore, since the center of mass energy of a 1000 TeV machine is only approximately 1.5 TeV, these linacs will be built in pairs and operated primarily as linear colliders. This means that the average beam power in one of the devices will be quite large. This in turn leads us toward high efficiency acceleration schemes, capable of high repetition rates. The poor efficiency of laser accelerators and other exotic proposals make them poor candidates for a future generation collider. DOE

N84-32158# Language Services, Knoxville, Tenn.
PULSED HIGH-CURRENT SOURCE OF NEGATIVELY CHARGED HYDROGEN IONS
Yu. I. Belchenko and G. I. Dimov 1983 20 p refs Transl. into ENGLISH of Preprint no. 83-109 Inst. of Nuclear Physics, Academy of Sciences, Novosibirsk
(Contract DE-AC05-84OR-21400)
(DE84-012989; ORNL-tr-5126) Avail: NTIS HC A02/MF A01

A high current cellular source (HCCS) is described. The high current glow discharge of the HCCS with open electron drift is localized in the extended gap between the emitting surface of the cathode and the anode cover with emission apertures. Operational parameters of the H(-) source are described. DOE

N84-32159# Brookhaven National Lab., Upton, N. Y.
ELECTROWEAK INTERACTION PARAMETERS
W. J. Marciano Apr. 1984 17 p refs Presented at 4th Topical Workshop on Proton Antiproton Collider Phys., Bern, 5 Mar. 1984
(Contract DE-AC02-76CH-00016)
(DE84-012910; BNL-34728; CONF-8403130-1) Avail: NTIS HC A02/MF A01

The parameters discussed include: the renormalized weak mixing angle, masses and widths of the W plus and minus and of the Z boson, radiative Z and W boson decays. The Higgs-top quark mass connection and the Grand Unification theories are briefly reviewed. It is suggested that a new pseudoscalar particle with a mass near 93 GeV could be produced by gluon-gluon fusion. DOE

N84-32160# Los Alamos Scientific Lab., N. Mex.
METASTABLE COMPLEXES OF HELIUM-HYDROGEN ISOTOPES
R. D. Taylor 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-22 Aug. 1984
(Contract W-7405-eng-36)
(DE84-009995; LA-UR-84-1088; CONF-840842-1) Avail: NTIS HC A02/MF A01

A long-lived, metastable, bound state between helium-3 and tritium was found. A number of experiments designed to help characterize this complex found to be present in both liquid and solid T2 are presented. A number of physical properties, such as vapor pressure, electrical conductivity, magnetic susceptibility, and ionic mobility as functions of composition, temperature, pressure, decay time, and physical state (liquid, solid, and/or gas) were measured. The production rate of He(3) from T2 is only 0.93 percent per month; nevertheless, changes in a number of physical properties from that of the initial He(3) free liquid are observed. DOE

N84-32161# Stanford Linear Accelerator Center, Calif.
ACCELERATION OF HIGH CHARGE DENSITY ELECTRON BEAMS IN THE SLAC LINAC
J. C. Sheppard, J. E. Clendenin, R. K. Jobe, V. G. Luth, A. Millich, M. C. Ross, J. T. Seeman, and R. F. Stiening Jan. 1984 4 p refs Presented at 1984 Linear Accelerator Conf., Seeheim-Darmstadt, 7-11 May 1984
(Contract DE-AC03-70SF-00515)
(DE84-012415; SU-SLAC-Pub-3284; CONF-840529-29) Avail: NTIS HC A02/MF A01

The Standard Linear Accelerator Center SLAC Liner Collider (SLC) will require both electron and positron beams of very high charge density and low emittance to be accelerated to about 50 GeV in the SLAC 3 km linac. The linac is in the process of being improved to meet this requirement. The program to accelerate an electron beam of high charge density through the first third of the SLC linac is described and the experimental results are discussed. DOE

N84-32162# Centre Technique des Industries Mecaniques, Senlis (France).
OPTICAL DENSITY RADIATION DOSE RELATIONSHIP Final Report [RELATION DENSITE DOSE DE RAYONNEMENT]
J. Rivenez, C. Lambert, G. Pelix (Institut National des Sciences Appliquees, Lyon), and D. Peyclit Dec. 1983 73 p In FRENCH
(CETIM-100680) Avail: NTIS HC A04/MF A01

Factors responsible for the spread in X-ray photograph optical density were studied. Radiation detectors for use in an exposure meter were tested. A process enabling a large number of films placed behind pieces of steel of various thicknesses to be irradiated simultaneously was developed. The most promising exposure meters are based on an ionization chamber, a Geiger counter with interchangeable window, and a CdTe semiconductor.
Author (ESA)

N84-32074# Joint Publications Research Service, Arlington, Va.
NONLINEAR DYNAMICS OF RESONANCE-TYPE INSTABILITY IN HIGH-DENSITY ELECTRON BEAM: ANALYTICAL SOLUTION Abstract Only
M. V. Kuzelev and V. A. Panin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 125-126 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Fiz. (Tomsk, USSR), v. 27, no. 1, Jan. 1984 p 31-35 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-32163# Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
A THEORETICAL STUDY OF THE ENERGETICS AND DYNAMICS OF HIGH ENERGY INELASTIC COLLISION PROCESSES Final Report, 1 Feb. 1981 - 14 May 1983
D. R. Herschback 7 Apr. 1984 9 p
(Contract F49620-80-C-0017)
(AD-A142799; AFOSR-84-0544TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The overall objective of this research program was to develop theoretical methods for improving the prediction of potential energy surfaces relevant to high energy inelastic collision processes. A diatomics-in-molecules approximation for constructing potential energy surfaces of excited electronic states of the prototypical triatomic hydrogen system was developed. A new approximation method was devised to estimate cross sections for inelastic or reactive collision processes from a rotating rigid rod model. These semiempirical approaches were complimented by a comprehensive statistical theory for vector properties of collisions, including all angular distributions describing the orientations of the initial and final relative velocity vectors and/or the reactant and product rotational angular momentum vectors. Author (GRA)

N84-32164# Los Alamos Scientific Lab., N. Mex.
SPACE REACTOR FUELS PERFORMANCE AND DEVELOPMENT ISSUES
E. M. Wewerka 1984 7 p refs Presented at Intersoc. Energy Conversion Engr. Conf., San Francisco, 19 Aug. 1984
(Contract W-7405-eng-36)
(DE84-011414; LA-UR-84-1381; CONF-840804-7) Avail: NTIS HC A02/MF A01

Three compact reactor concepts are now under consideration by the US Space Nuclear Power Program (the SP-100 Program) as candidates for the first 100-kWe-class space reactor. Each of these reactor designs puts unique constraints and requirements on the fuels system, and raises issues of fuel systems feasibility and performance. A brief overview of the fuel requirements for the proposed space reactor designs, a delineation of the technical feasibility issues that each raises, and a description of the fuel systems development and testing program that was established to address key technical issues are presented. DOE

N84-32165# Argonne National Lab., Ill.
SURPLUS FACILITIES MANAGEMENT PROGRAM. POST-REMEDIAL-ACTION SURVEY REPORT FOR SNAP-8 EXPERIMENTAL REACTOR FACILITY, BUILDING 010 SITE, SANTA SUSANA FIELD LABORATORIES, ROCKWELL INTERNATIONAL, VENTURA COUNTY, CALIFORNIA
R. A. Wynveen, W. H. Smith, C. M. Sholeem, C. B. Mayes, A. L. Justas, and K. F. Flynn Apr. 1984 94 p refs
(Contract W-31-109-eng-38)
(DE84-009591; DOE/EV-0005/47; ANL-OHS/HP-84-102) Avail: NTIS HC A05/MF A01

Based on the results of the radiological assessment the following conclusions were reached: (1) soil contaminated with the radionuclides Co(60) and Er(152)Eu of undetermined origin was detected in the southwest quadrant of the Building 010 site. Co(60) was also detected in a borehole sample taken from the area that previously held the radioactive gas hold up tanks. Uranium was detected in soil from a hole in the center of the building site and in a second hole southwest of the building site. In all cases, the radionuclide levels encountered in the soil were well below the criteria set by DOE for this site; and (2) the direct instrument readings at the surface of the site were probably the result of natural radiation (terrestrial and celestial), as well as shine from the material being stored at the nearby RMDF facility. There was no evidence that the contaminated soil under the asphalt pad contributed detectable levels to the total background readings.
DOE

N84-32166# Department of Energy, Oak Ridge, Tenn.
REFRACTORY ALLOY TECHNOLOGY FOR SPACE NUCLEAR POWER APPLICATIONS
R. H. Cooper, Jr., ed. and E. E. Hoffman, ed. Jan. 1984 285 p refs Proc. of the Symp. on Refractory Alloy Technol. for Space Nucl. Power Appl., Oak Ridge, Tenn., 10-11 Aug. 1983
(Contract W-7405-eng-26)
(DE84-001745; CONF-8308130) Avail: NTIS HC A13/MF A01

Purpose of this symposium is twofold: (1) to review and document the status of refractory alloy technology for structural and fuel-cladding applications in space nuclear power systems; and (2) to identify and document the refractory alloy research and development needs for the SP-100 Program in both the short and the long term. An effort was made to recapture the space reactor refractory alloy technology that was cut off in midstream around 1973 when the national space nuclear reactor program begun in the early 1960s, was terminated. The six technical areas covered in the program are compatibility, processing and production, welding and component fabrication, mechanical and physical properties, effects of irradiation, and machinability. The refractory alloys considered are niobium, molybdenum, tantalum, and tungsten.

Thirteen of the 14 pages were abstracted separately. The remaining paper summarizes key needs for future R and D on refractory alloys. Author

N84-32167# Los Alamos Scientific Lab., N. Mex.
REENTRY ANALYSIS
Franz A. Biehl May 1984 8 p Presented at the 1st SP-100 Program Integration Meeting, Danvers, Mass., 13-15 Jun. 1984
(Contract W-7405-eng-36)
(DE84-012640; LA-UR-84-1559; CONF-8406131-1) Avail: NTIS HC A02/MF A01

The criteria, previous nuclear experience in space, analysis techniques, and possible breakup enhancement devices applicable to an acceptable SP-100 reentry from space are examined. Reactor operation in nuclear safe orbit will minimize the radiological risk; the remaining safeguards criteria need to be defined. A simple analytical point mass reentry technique and a more comprehensive analysis method that considers vehicle dynamics and orbit insertion malfunctions are presented. Vehicle trajectory, attitude, and possible breakup enhancement devices will be integrated in the simulation as required to ensure an adequate representation of the reentry process. DOE

74 OPTICS

Includes light phenomena.

N84-32168*# Alabama Univ., Birmingham. Dept. of Physics.
THEORETICAL DESIGN AND ANALYSIS OF THE LAYERED SYNTHETIC MICROSTRUCTURE OPTIC FOR THE DUAL PATH X-RAY TELESCOPE Final Report, 1 Mar. - 31 May 1984
D. L. Shealy and S. Chao 10 Jun. 1984 49 p
(Contract NAS8-35916)
(NASA-CR-171133; NAS 1.26:171133) Avail: NTIS HC A03/MF A01 CSCL 20F

A ray tracing analysis was performed for several configurations for the inner channel of the dual path X-ray telescope, which is proposed to use the second mirror of the Stanford/MSFC Wolter-Schwarzchild telescope and a normal incident layered synthetic microstructure (LSM) mirror to form a secondary image near the front of the telescope. The LSM mirror shapes considered were spherical, ellipsoid, hyperboloid, and constant optical path length (OPL) aspheric. Only the constant OPL case gave good axial resolution. All cases had poor off axis resolution as judged by the RMS blur circle radius. Author

N84-32169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY EXPERIMENTS ON PHASE CONJUGATION FOR FLOW VISUALIZATION
David Weimer (Ohio Northern Univ.) and Walton L. Howes Aug. 1984 19 p refs
(NASA-TM-83766; E-2089; NAS 1.15:83766) Avail: NTIS HC A02/MF A01 CSCL 20F

Barium titanate single crystals are discussed in the context of: the procedure for polarizing a crystal; a test for phase conjugation; transients in the production of phase conjugation; real time readout by a separate laser of a hologram induced within the crystal, including conjugation response times to on-off switching of each beam; and a demonstration of a Twyman-Green interferometer utilizing phase conjugation. Author

N84-32170# Mississippi Univ., University. Physical Acoustics Research Lab.
MIE SCATTERING AS A TECHNIQUE FOR THE SIZING OF AIR BUBBLES Ph.D. Thesis
G. M. Hansen and L. A. Crum 1 Jun. 1984 79 p
(Contract N00014-84-C-0193)
(AD-A142737; TR-1-84) Avail: NTIS HC A05/MF A01 CSCL 20/6

A technique has been developed which allows the radius of a bubble in a fluid to be accurately measured without disturbing the bubble. Results are presented which show that radius measurements of single air-bubbles in water can be achieved by shining a He-Ne laser on the bubble and measuring the light scattered at 80 degrees. Light intensity measurements at a scattering angle of 55 degrees were used to calibrate a photodiode detection system and to demonstrate the correlation of data with Mie scattering theory. The photodiode was then moved to 80 degrees for actual radius measurements. This technique was accurate to within 3% for bubbles with radii less than 80 microns. Author (GRA)

N84-32171# Wisconsin Univ., Madison.
A STUDY OF THE DRAWING PROCESS FOR OPTICAL FIBERS Technical Summary Report
J. C. Strikwerda May 1984 22 p
(Contract DAAG29-80-C-0041)
(AD-A142930; MRC-TSR-2693) Avail: NTIS HC A02/MF A01 CSCL 12/1

Optical fibers are produced by heating a silica rod and pulling on the rod to produce a thin fiber. This process involves several interacting effects, especially the temperature dependent viscosity of the rod, and the shape of the rod in the transition zone. In this paper the equations describing this process are studied by means of a perturbation analysis using as the perturbation parameter the ratio of the rod to the length of the furnace. The silica rod is usually doped so that it will have special optical properties and it is important to know the concentration of the dopant in the final fiber. Simple equations for the significant terms in the perturbation series are obtained for all quantities of interest. A simple formula is obtained which expresses the radius of the fiber in terms of the initial radius of the rod, the drawing force and other important parameters. Author (GRA)

N84-32172# Howard Univ., Washington, D. C. Dept. of Chemistry.
RAMAN INVESTIGATION OF THE RATE OF OH UPTAKE IN STRESSED AND UNSTRESSED OPTICAL FIBERS
G. E. Walrafen, P. N. Krishnan (Coppin State Coll., Baltimore, Md.), and D. R. Hardison, Jr. (Tracor, Inc., Rockville, Md.) 24 May 1984 14 p Presented at the 83rd Ann. Meeting of the Am. Ceram. Soc., Washington, D.C., 6 May 1981
(Contract N00014-80-C-0305)
(AD-A143142; TR-18) Avail: NTIS HC A02/MF A01 CSCL 20/6

Raman measurements of the rate of OH uptake in silicone-clad pure fused silica optical filters (530 ppm initial OH), immersed in water at room temperature, were accomplished with and without tensile stress by determining the integrated intensity of the OH-stretching contour at approx. 3690 per cm. Up to tensile stresses of 1.56 GPa (15.6 kbar), no significant changes in the rate of OH uptake, relative to the uptake rate for an unstressed fiber, were observed. For diffusion through silicone rubber, a 14% increase in the overall Raman OH signal from the fused silica occurred in 200 h. This 14% increase means that a large increase in the OH concentration occurred within a few microns from the surface of the 200 micron diameter fiber, because diffusion of water is very slow in fused silica at room temperature.
Author (GRA)

N84-32173# California Univ., Berkeley. Lawrence Berkeley Lab.
FAR INFRARED OPTICAL PROPERTIES OF WbSe3
W. A. Challener and P. L. Richards Feb. 1984 5 p refs Presented at 3rd Intern. Conf. on Infrared Phys., Zurich, 23 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE84-009223; LBL-17293; CONF-840725-3-Summ) Avail: NTIS HC A02/MF A01

The far infrared reflectance of NbSe3 was measured and a Kramers-Kronig analysis was used to obtain the estimate of the frequency dependence of the conductivity, delta1 (LC OMEGA). The qualitative features of the conductivity include many phonons which appear below T2, and a low frequency contribution from the free carriers and the pinned mode. DOE

N84-32174# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
MICROSTRUCTURAL STABILITY OF COPPER ELECTROPLATE
B. M. Hogan and J. A. Roth (TRW, Inc., Redondo Beach, Calif.) 1984 16 p refs Presented at the American Electroplaters' Society SUR/FIN 1984 Conf., New York, 16-20 Jul. 1984
(Contracts W-7405-eng-36; DARPA-29601-80-C-0040)
(DE84-010070; LA-UR-84-877; CONF-840711-3) Avail: NTIS HC A02/MF A01

Microstructural stability of metals used for high quality optics is necessary to maintain the low light scatter properties of the optical surface. Room temperature recrystallization of metal causes a roughening of the single point diamond turned (SPDT) surfaces and increases the light scatter. Differential scanning calorimetry, microstructure analysis, X-ray diffraction microhardness, and mechanical properties cause the low temperature recrystallization. Electroplating conditions causing the high stresses and methods of reducing the stresses after plating are discussed. DOE

N84-32175# Sandia Labs., Albuquerque, N. Mex.
A MULTI-GHz MULTI-CHANNEL PHOTONIC ANALOG DATA PROCESSING SYSTEM
J. Chang, W. Filter, G. Lockwood, and B. Neyer 1984 5 p refs Presented at the SPIE Tech. Symp., Arlington, Va., 29 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012281; SAND-84-1029C; CONF-8404124-5) Avail: NTIS HC A02/MF A01

Oscilloscopes based on the cathode ray tube technology are the basis of conventional high speed data recording at analog bandwidths greater than 200 MHz. With the advent of high bandwidth optical fibers sensors, an alternate and eventually more economical method for high speed data recording is possible. In this approach, the combined broad band characteristics of the optical fiber and the electro-optical streak camera are utilized to extend bandwidth, to limit signal degradation, and to permit synchronous multichannel high speed data recording. DOE

N84-32176# Sandia Labs., Albuquerque, N. Mex.
RADIATION EFFECTS IN OPTOELECTRONIC DEVICES
C. E. Barnes and J. J. Wiczer May 1984 348 p refs
(Contract DE-AC04-76DP-00789)
(DE84-012889; SAND-84-0771) Avail: NTIS HC A15/MF A01

Results of radiation damage studies at Sandia National Laboratories are summarized. A literature review of such damage to the components of optoelectronic systems is included. Light emitting diodes (LEDs), laser diodes, photodetectors, optical fibers, and optical isolators are considered according to device type. Device properties relevant to radiation effects are discussed. DOE

N84-32177# Zeiss (Carl), Oberkochen (West Germany). Entwicklung Mikroskope.
MODULAR IMAGE ANALYSIS SYSTEM Final Report, Dec. 1981
Axel Rohde Bonn Bundesministerium fuer Forschung und Technologie May 1984 40 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-074; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8.50

The development of a modular image analyzer system is described. It consists of the basic instrument, application hardware, control software and user software. The hardware is characterized by high operating speed and rapid data reduction through limiting to one binary image process. This enables acquisition of 4 basic measuring values in real time from the video signal within 20 msec. The control software as firmware for the internal processor controls all detailed operations necessary for measurement acquisition. The processor permits the realization of single purpose fully automatic image analyzers without an external calculator. A simple programming language specially for image analysis was defined for the user software so that program development is possible using any calculator with an IEC interface. Author (ESA)

N84-32178# Zeiss (Carl), Oberkochen (West Germany). Geschaeftsbereich Vermessung.
OPTIMIZING TOOLS FOR GENERATING SPHERICAL SURFACES AND POLISHING POWDERS IN OPTICAL PRODUCTION TECHNOLOGY Final Report, Dec. 1981
Hans-Joachim Juranek, Wolf Dieter Sinnecker, and Herbert Taeurer Bonn Bundesministerium fuer Forschung und Technologie May 1984 32 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-094; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7

The influence of important tool parameters on the quality of the glass surface in the generating process of optical spheres was investigated. Only high cutting speeds are of interest. Polishing powder properties of direct pratical interest, such as break-in behavior, stock removal rate, chemical reactivity, cleanliness, i.e., scattering behavior of polished glass, are determined.
Author (ESA)

N84-32179# National Bureau of Standards, Boulder, Colo. Elctromagnetic Technology Div.
MEASUREMENT OF MULTIMODE OPTICAL FIBER ATTENUATION: AN NBS SPECIAL TEST SERVICE
R. L. Gallawa, G. E. Chamberlain, G. W. Day, D. L. Franzen, and M. Young Feb. 1984 30 p refs
(PB84-192202; NBSIR-83-1691) Avail: NTIS HC A03/MF A01 CSCL 20F

Optical fiber measurement procedures and capabilities at the National Bureau of Standards are described. The measurement of attenuation of multimode, telecommunication grade fibers for the wavelength range of 850 nm to 1300 nm is detained. The measurement procedure is based on the Electronics Industries Association Recommended Standard as published in RS 455 and uses two restricted launch conditions, either of which may be used to control the modal power distribution at launch. The intent is to approximate the conditions that exist in a long link, to the end that the reported attenuation coefficient is indicative of what can be expected in long, concatenated links. Author (GRA)

N84-31184*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FIBER OPTICS FOR THE FUTURE - WAVELENGTH DIVISION MULTIPLEXING
J. L. Spencer *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 871-888 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003579) Avail: NTIS HC A25/MF A01 CSCL 09C

N84-31447# Joint Publications Research Service, Arlington, Va.
PHASE LIGHT RANGE FINDER Abstract only
A. D. Nizhenskiy, V. B. Volkonskiy, I. N. Zhukinskiy, V. M. Kodryanskiy, A. G. Kononenko, Yu. A. Masyurenko, Yu. V. Popov, and V. V. Yakovlev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 43 Transl. into EnGLISH from Izmer. Tekh. (Moscow), no. 2, Feb. 1984 p 35-36 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-32069# Joint Publications Research Service, Arlington, Va.
NEWLY DISCOVERED EFFECT OF INTERACTION OF OPTICAL RADIATION AND GLASS Abstract Only
L. B. Glebov, V. G. Dokuchayev, N. V. Nikonorov, and G. T. Petrovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 85-86 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 3, Jan. 1984 p 568-571 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32099# Joint Publications Research Service, Arlington, Va.
FOCUSERS OF OBLIQUELY INCIDENT LASER RADIATION Abstract Only
A. V. Goncharskiy, V. A. Danilov, V. V. Popov, A. M. Prokhorov, I. N. Sisakyan, V. A. Sayfer, and V. V. Stepanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 60 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 11, no. 1, Jan. 1984 p 166-168 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32100# Joint Publications Research Service, Arlington, Va.
FIBER OPTIC LIGHT GUIDES BASED ON POLYMER COATED MULTICOMPONENT GLASSES Abstract Only
V. V. Grigoryants, V. A. Detinich, A. A. Izyneyev, V. B. Kravchenko, V. P. Minkovich, and Yu. K. Chamorovskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 64 Transl. into ENGLISH from Fiz. i Khim. Stekla (Leningrad), v. 9, no. 3, May - Jun. 1983 p 371-373 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32224# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
A WIDE FIELD-OF-VIEW CRT PROJECTION SYSTEM WITH OPTICAL FEEDBACK FOR SELF ALIGNMENT
P. Lyon *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 1-9 (For primary document see N84-32223 21-81) (AD-P003447) Avail: NTIS HC A17/MF A01 CSCL 20/6

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-32180 California Inst. of Tech., Pasadena.
ELECTROMAGNETIC RADIATION AND SCATTERING IN A PLASMA WITH AZIMUTHAL BIASING FIELD Ph.D. Thesis
Larry Kevin Warne 1984 171 p
Avail: Univ. Microfilms Order No. DA840538

The problem of radiation from an electric line source in a homogeneous, cold, incompressible electron plasma is considered when a large static current is superposed. The static axial current gives rise to a magnetostatic biasing field which is oriented in the azimuthal direction and varies with radial distance. When the driving frequency is greater than the plasma requency, and the medium is assumed to be unbounded, the presence of the static current reduces the amount of radiation. On the other hand, if the driving frequency is less than the plasma frequency and the medium is assumed to be bounded, the amount of radiation is increased. The problem of scattering from an axial current in a plasma is also considered. The medium in this problem is taken to be a bounded column of plasma containing a radially distributed axial current. At normal incidence the scattered wave contains a cross polarized field component due to the gyrotropic nature of the column. The scattered cross polarized component vanishes in the incident direction as well as in the backward direction. This null is explained by considering the effect of Faraday rotation on various rays traversing the column. Solutions to the scattering problem when the axial current density varies inversely with radial distance are considered in some detail. Dissert. Abstr.

N84-32181# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RAY TRACING STUDY OF ELECTRON CYCLOTRON HEATING IN THE TBR 2 TOKAMAK
Antonio Montes and Joaquim Paulino Leite Jul. 1984 13 p refs Presented at the 4th Simp. Nipo-Brasileiro de Cienc. e Technol., Sao Paulo, 7-9 Aug 1984
(INPE-3192-PRE/556) Avail: NTIS HC A02/MF A01

A ray tracing code was used to study electron cyclotron heating in the future Brazilian Tokamak TBR 2. Ray patterns similar to those of an actual antenna were initiated and a full graphic package was developed to display the behavior of the rays. The plasma and wave parameters were varied in order to establish which parameters are most important in optimizing the energy deposition. Author

N84-32182# Nagoya Univ. (Japan). Institute of Plasma Physics.
ELECTRON CAPTURE CROSS SECTIONS IN HIGH ENERGY He2+ + NEUTRAL Li COLLISIONS
M. Sasao, K. N. Sato, A. Matsumoto, A. Nishizawa, S. Takagi, S. Amamiya, T. Masuda, Y. Tsurita, F. Fukuzawa, Y. Haruyama et al May 1984 13 p refs
(IPPJ-679) Avail: NTIS HC A02/MF A01

Single and double electron capture cross sections for He(2+) in collision with Li(0) were measured in the energy range of 0.8 to 2.0 MeV. The lithium target density was determined absolutely by the Rutherford scattering measurement. The results are consistent with data measured at lower energies. With these cross sections, the estimation of He(0) counting rates in the alpha particle diagnostics of a future reacting plasma experiment was made. R.S.F.

N84-32183# Yamanashi Univ., Kofu (Japan). Faculty of Engineering.
RELATIVISTIC VECTOR SUB P X VECTOR SUB B ACCELERATION OF CHARGED PARTICLES BY AN OBLIQUELY PROPAGATING ELECTROSTATIC WAVE
K. Sakai, S. Takeuchi, and M. Matsumoto Nagoya, Japan Nagoya Univ. May 1984 15 p refs Sponsored in part by Nagoya Univ.
(IPPJ-680) Avail: NTIS HC A02/MF A01

A relativistic theory is developed for the vector v(sub p) x vector B acceleration of charged particles trapped by an electrostatic wave. The amplitude E of electric field, the phase velocity vector v(sub p) and the angle Theta between vector v(sub p) and the external magnetic field vector B are arbitrary. If E/B>1/square root of 2 and the angle Theta is appropriately chosen, initially trapped particles never detrap and an indefinite increase of the particle energy takes place. Author

N84-32184# Nagoya Univ. (Japan). Lab. of Beam-Fusion Technology.
PROCEEDINGS OF COLLABORATING RESEARCH MEETING ON PARTICLE-BEAM APPLICATIONS TO FUSION RESEARCH
Kiyoshi Yatsui, ed. (Technological Univ. of Nagaoka, Niigata, Japan) Nagoya, Japan Nagoya Univ. May 1984 300 p refs Meeting held at Nagoya, Japan, 21-22 Nov. 1983
(IPPJ-678) Avail: NTIS HC A13/MF A01

Intense pulsed light-ion beams (LIB) and relativistic electron beams (REB) were discussed in viewpoints from generation to application. Twenty-five papers are presented in the fields associated with pulse-power technology, beam focusing and propagation, beam interaction with matter, target design, reactor design, and applications of the LIB and REB. M.G.

N84-32185# Columbia Univ., New York. Plasma Physics Lab.
SAFETY AND DETERMINISTIC FAILURE ANALYSES IN HIGH-BETA D-D TOKAMAK REACTORS
Elizabeth Carol Selcow 1984 116 p refs Sponsored in part by Public Service Electric Corp. and Argonne National Lab.
(Contract DE-AC02-76ET-53016)
(DE84-012693; DOE/ET-53016/T3; COO-2456/85) Avail: NTIS HC A06/MF A01

Safety and deterministic failure analyses were performed to compare major component failure characteristics for different high beta D-D Tokamak reactors. The primary focus was on evaluating damage to the reactor facility. The analyses also considered potential hazards to the general public and operational personnel. Parametric designs of high beta D-D Tokamak reactors were developed, using WILDCAT as the reference. The size, and toroidal

field strength were reduced, and the fusion power increased in an independent manner. These changes were expected to improve the economics of D-D Tokamaks. Issues examined using these designs were radiation induced failure, radiation safety, first wall failure from plasma disruptions, and toroidal field magnet coil failure. DOE

N84-32186# GA Technologies, Inc., San Diego, Calif.
HIGH POWER NEUTRAL BEAM HEATING ON DOUBLET 3
D. O. Overskei, C. J. Armentrout, J. F. Baur, F. P. Blau, G. Branson, K. H. Burrell, R. P. Chase, J. C. DeBoo, S. Ejima, E. S. Fairbanks et al Mar. 1984 22 p refs Presented at 4th Intern. Symp. on Heating in Toroidal Plasmas, Rome, 21 Mar. 1984
(Contract DE-AT03-84ER-51044)
(DE84-012471; GA-A-17528; CONF-840311-13) Avail: NTIS HC A02/MF A01

Energy confinement studies with up to 7.5 MW of neutral beam heating power were performed on the Doublet 3 Tokamak. During beam injection divertor operation results in up to a factor of two improvement in energy confinement as compared to comparable limiter discharges. In both configurations the confinement improves linearly with plasma current. In addition, there are indications that a plateau in energy confinement time is reached with injection at high power levels. In all configurations electron transport is the major heat loss channel. Transport analysis indicates that the electron thermal conductivity is typically a factor of 2 to 3 lower in diverted discharges as compared to comparable limiter dischargers. However, there are indications that the plasma edge may be important since improved confinement is correlated with the separation between the limiter and the separatrix. DOE

N84-32187# Sandia Labs., Albuquerque, N. Mex.
CURRENT STATUS OF CALCULATIONS AND MEASUREMENTS OF ION STOPPING POWER IN ICF PLASMAS
T. A. Mehlhorn, J. M. Peek, E. J. McGuire, J. N. Olsen, and F. C. Young (NRL, Washington, D.C.) Dec. 1983 26 p refs Presented at the Intern. Workshop on Atomic Phys. for Ion Driven Fusion, Paris, 21-25 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE84-005880; SAND-83-1519; CONF-830354-1; SAND-83-0663C) Avail: NTIS HC A03/MF A01

More precise stopping power modes for use in ICF target design need to be developed. The light ion beam ICF program is now moving into a phase where ad hoc scaling of certain key physics parameters in the stopping power models is no longer sufficient. The goal is to predict ion ranges in ICF targets to within about 10 to 20%. A verified stopping power mode is also essential in diagnosing target irradiation intensities; such data are only inferred by target response. Presently, the area of primary concern involves calculating the stopping power of the bound electrons of partially ionized atoms. One bound electron stopping power model that is investigated uses the local oscillator model along with Hartree-Fock-Slater atomic charge density profiles to calculate I (Z,q,E), a generalized average ionization potential for the target electrons. This method is studied systematically to look for deficiencies in the underlying physics model, especially at low projectile velocities. Another procedure uses the generalized oscillator strength model to calculate the bound electron stopping. DOE

N84-32188# Rochester Univ., N. Y. Lab. for Laser Energetics.
A NEW MODEL OF RAMAN SPECTRA IN LASER PRODUCED PLASMA
Albert Simon and Robert W. Short 3 Jul. 1984 5 p refs Presented at the Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun. 1984
(Contract DE-AC08-80DP-40124)
(DE84-009625; DOE/DP-40124/22; CONF-840616-14) Avail: NTIS HC A02/MF A01

Experimental observations of Raman scattering in laser produced plasma can be explained by ordinary incoherent Thompson scattering, with a greatly enhanced plasma line. Transient local reversed-slope velocity distributions in the underdense region can be produced by pulses of hot electrons arising from the two-plasmon or absolute stimulated Raman instabilities (SRS-A) occurring near the quater critical surface. A simple model yields the observed spectral gaps near the incident frequency (LC OMEGA) 0 and near (LCOMEGA)0/2. It also explains the correlation of onset of this scattering with onset of the SRS-A, its transient localization in frequency and time, and the weak azimuthal angular variation. The existence of an upscattered frequency band is also predicted and been verified by experiment. DOE

N84-32189# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
AZIMUTHAL ELECTRIC FIELDS AND TANDEM AMBIPOLARITY
P. J. Catto, J. R. Myra, X. S. Lee, and G. L. Francis Apr. 1984 11 p refs
(Contract DE-AC03-76ET-53057)
(DE84-010843; SAI-84-3032; PRI-76) Avail: NTIS HC A02/MF A01

The importance of retaining the azimuthal variation of the electrostatic potential in transport and ambipolarity studies is demonstrated. Because the azimuthal electric field must satisfy quasi-neutrality, equilibrium ambipolar operation permitting different ambipolar roots at different radii is energetically not possible. Moreover, in the tandem mirror model considered herein, the only acceptable ambipolar root is not accessibly for significantly inverted source profiles and does not permit the density profile to invert radially. DOE

N84-32190# Rochester Univ., N. Y.
HOW USEFUL ARE ODD-INTEGER HALF-HARMONICS
W. Seka, L. M. Goldman, K. Tanaka, R. Afeyan, A. Simon, and R. Short 17 Feb. 1984 21 p refs Presented at Anomalous Absorption Conf., Charlottesville, Va., 6 May 1984
(Contract DE-AC08-80DP-40124)
(DE84-012392; DOE/DP-40124/37) Avail: NTIS HC A02/MF A01

Odd-integer half-harmonic spectra from laser-produced plasmas were reported since 1970. They were clearly identified as related to parametric processes near n sub c/4, most prominently the 2 omega sub p decay instability. Arguments for the exercise of greater caution in the use of the 3 omega/2 spectral splitting as a temperature diagnostic are presented. A model to explain the various features of the omega/2 spectra is discussed and it is shown that one of its features is well suited as a temperature diagnostic. Futhermore, fine structure observed in both the omega/2 and 3 omega/2 spectra which appears to be related to secondary decay processes near n sub c/4 is discussed. DOE

N84-32191# Georgia Inst. of Tech., Atlanta.
INVESTIGATION OF NEUTRAL BEAM DRIVEN IMPURITY FLOW REVERSAL AS AN IMPURITY CONTROL METHOD IN FUTURE TOKAMAKS
R. B. Bennett and W. M. Stacey, Jr. Mar. 1984 28 p refs
(Contract DE-AS05-78ET-52025)
(DE84-008835; GTFR-46) Avail: NTIS HC A03/MF A01

A theory for the effect of directed neutral beam injection on impurity transport in Tokamaks is extended to include temperature gradient effects. The extended theory is compared with experimental data, from PLT, and certain coefficients are adjusted to provide agreement. The adjusted theory is applied to assess the potential of neutral beam injection (NBI) being used to prevent impurities from penetrating to the center of future Tokamak plasmas, thereby possibly creating a cold radiating edge. The results indicate the possibility of creating a cold radiating edge in the Tokamak Fusion Test Reactor and in future Tokamaks represented by FED and STARFIRE. DOE

N84-32192# Wisconsin Univ., Madison.
DISRUPTIVE INSTABILITIES IN A POLOIDAL DIVERTOR TOKAMAK Ph.D. Thesis
T. H. Osborne Feb. 1984 137 p refs
(Contract DE-AC02-76ET-53051)

(DE84-013054; DOE/ET-53051/63) Avail: NTIS HC A07/MF A01

Tokamak discharges are observed with safety factor q, as low as 0.5 over most of the current channel within the poloidal divertor separatrix. These discharges show sawtooth oscillations, but magnetic probe measurements indicate the central g-values, instead of relaxing to 1, remain nearly fixed. The q = 1 surface for this case is very near the separatrix, and there is a small oscillation in q near the q = 1 surface which is time correlated with the sawtooth oscillations. At low toroidal plasma current and high toroidal field, several small sawteeth of period 100 to 200 (MU)s are superimposed on giant sawteeth of period 1ms. Precursor oscillations with even m and odd n are observed on magnetic loops for both types of sawtooth oscillations. As the plasma current is increased with the toroidal magnetic field constant, the giant sawteeth become less regular. At large enough plasma current, only small sawtooth oscillations are observed; these show an m = n = 1 precursor in the soft X-ray. An MHD equilibrium code predicts that the q = 2 surface is very near the divertor separatrix for this case. This suggests that the m = 2, n = 1 disruption may be eliminated by the proximity of the q = 2 surface and the separatrix. DOE

N84-32193# Wisconsin Univ., Madison.
SECOND HARMONIC ELECTRON CYCLOTRON EMISSION STUDIES OF TOKAPOLE-2 PLASMAS Ph.D. Thesis
Mar. 1984 132 p refs
(DE84-013103; DOE/ET-53051/65) Avail: NTIS HC A07/MF A01

The electron temperature is an important parameter in plasma physics. The intensity of electron cyclotron emission (ECE) is a function of the electron temperature. This function reduces to a direct proportionality for optically thick plasmas. The ECE was studied to understand various plasma properties. The principal diagnostic used as a radiometer consisting of a microwave superheterodyne receiver operating in the K-band, GHz, and fed by a three inch parabolic mirror with a spot size of about 4.4 cm. The entire microwave assembly can be rotated through 90(0) about the mirror axis to facilitate polarization measurements. A ray tracing analysis of Tokapole-2 shows that refraction is significant for plasmas observed in this work. DOE

N84-32194# McElroy (Ralph) Co., Austin, Tex.
PROTECTIVE PLASMA ENVELOPE
V. N. Bockarov, S. G. Konstantinov, A. M. Kudryavtsev, O. K. Myskin, V. M. Panasyuk, and F. A. Tselnik Jun. 1984 16 p refs Transl. into ENGLISH of "Zashchitnaya Plazmennaya Obolochka" Preprint 83-77 USSR, 1983 Prepared for California Univ., Lawrence Livermore Lab
(Contract W-7405-eng-48)
(DE84-013316; UCRL-Trans-11972; Preprint-83-77) Avail: NTIS HC A02/MF A01

A method of creating an annular plasma envelope used to protect the hot plasma from flows of impurities and gases from the walls of the vacuum chamber is described. The diameter of the envelope is 30 cm, the thickness of the wall is 1.5 cm, the length is 2.5 m, and its density is from 10 to the 13th power to 10 the 14th power cu cm. The envelope attenuates the incident (from outside) flow of helium 10-fold and the flow of hydrogen 20-fold. DOE

N84-32195# McElroy (Ralph) Co., Austin, Tex.
PROBING A PLASMA WITH HIGH-ENERGY BEAMS OF ATOMS USING THRESHOLD DETECTORS
V. N. Bocharov, S. G. Konstantinov, A. M. Kudryavtsev, O. K. Myskin, V. M. Panasyuk, and F. A. Tselnik Jun. 1984 15 p refs Transl. into ENGLISH of "Zondirovanie Plazmy Vysokoenergichnymi Puchkami Atomov s Ispolzovaniem Porogovykh Detektorov" IYaF Preprint, Novosibirsk, 1982
(Contract W-7405-eng-48)
(DE84-013360; UCRL-Trans-11970) Avail: NTIS HC A02/MF A01

A method is described for a significant increase to 10(4) the signal/noise ratio during active corpuscular diagnostics of plasma by using a high-energy (to 80 keV) beam of helium atoms and a system of silicon semiconductors with low registration thereshold, aprox. 15 keV. Applification factors of detectors in the 10 to 70 keV range were measured, and the results of measurements of the radial profile of density and potential of a spinning plasma are given. DOE

N84-32196# California Univ., Los Angeles.
START/TM: A STUDY OF START-UP AND FRACTIONAL POWER OPERATION OF TANDEM MIRROR FUSION REACTORS
Robert W. Conn, ed., Nasr M. Ghoniem, ed., and Farrokh Najmabadi, ed. Jan. 1984 409 p refs
(Contract DE-AT03-80ER-52061)
(DE84-011477; DOE/ER-52061/2; UCLA/PPG-764) Avail: NTIS HC A18/MF A01

Start-up, shutdown and fractional power operation are important parts of power reactor operation. Special requirements for operation during these phases often place design constraints on key subsystems and can influence the fundamental design approach. These problems for tandem mirror fusion reactors (TMR's0 are investigated and referred to as the START/TM study. As a basis for the work, the MRS conceptual tandem mirror reactor design is used as the general reactor model. An overall framework is developed for start-up and fractional power increases to full power, applicable to any fusion reactor. Five phases are identified that include initial commissioning, cold or hot shutdown, system testing and plasma initiation to a standby mode, staged power increases, and rated power operation. Both general and specific constraints associated with these phases are identified and a plasma shutdown scenario is developed. DOE

N84-32197# Georgia Inst. of Tech., Atlanta.
A SURVEY OF THE METHODS OF MHD ANALYSIS OF MAGNETIC ISLANDS
R. N. Morris Nov. 1983 49 p refs
(Contract DE-AS05-78ET-52025)
(DE84-008858; GTFR-44) Avail: NTIS HC A03/MF A01

The structure, importance of, and the MHD analysis of tearing modes is explained. The reduced MHD equations are shown to offer the ability to follow the time evolution of tearing modes, but at a high cost in computer resources. The quasilinear equations have the ability to model more complex geometric situations, but at the expense of the time dependence of the equations. The derivation of both methods are outlined. DOE

N84-32198# Los Alamos Scientific Lab., N. Mex.
HIGH DENSITY Z PINCH AS A SMALL LOW-ENERGY FUSION DEVICE
J. E. Hammel, D. W. Scudder, and J. S. Shlachter 1984 8 p refs Presented at the Conf. on Dense Z Pinches for Fusion Reactors, Alexandria, Va., 29-30 Mar. 1984
(Contract W-7405-eng-36)
(DE84-009992; LA-UR-84-1075; CONF-8403100-3) Avail: NTIS HC A02/MF A01

A Z pinch in the density range 0.5 x 10 to the 20th power to 10 to the 21st power cu cm was investigated. The pinch was created in one to four atmospheres of hydrogen on the axis of a cylindrical chamber through the combination of laser beam preionization and high electric field breakdown between electrodes separated by 5 cm. The low divergence laser beam focused by a 2 m focal length lens entered the chamber through a .64 cm hole in the ground electrode and was dumped in a cavity in the high voltage electrode. The pinch electrodes were driven by a 1.6 ohm, 600 kV water transmission line switched to the load through a multipoint water breakdown switch. The line was charged by a 12 kJ, 600 kV Marx generator. The 30 nsec neodymium laser pulse was fired 50 to 100 nsec prior to the arrival of the high voltage pulse. The 500 kV pulse gave an initial current rise rate of 4 x 10 to the 12th power and a peak current of 300 kA in 200 nsec. DOE

N84-32199# Los Alamos Scientific Lab., N. Mex.
NONTHERMAL EFFECTS ON THE DIAGNOSTICS OF A COLLAPSING GAS SHELL Z-PINCH
L. A. Jones and D. R. Kania 1984 10 p refs Presented at the Conf. on Z Pinches for Fusion Reactors, Alexandria, Va., 29-30 Mar. 1984
(Contract W-7405-eng-36)
(DE84-009996; LA-UR-84-1077; CONF-8403100-1) Avail: NTIS HC A02/MF A01

The collapsing gas shell Z pinch is powered by a 72 kJ - 600 kV Marx bank. This Marx bank consists of 12, 6 stage modules which are used to pulse charge a 1 (UC OMEGA) -90 nsec long water line in approx. 500 nsec. The plasma produced by this device is well diagnosed, but rather than present the results of all the diagnostics, only those relevant to nonthermal effects are discussed. A spectrum taken with a 1 m vacuum ultraviolet spectrograph is shown. A section of the spectrum was microdensitometered to show Ar X-XIII. This same instrument was used to image the spectrum both axially and radially. The same portion of the spectrum discussed above is shown along with a time integrated, filtered (1 to 6 keV) X-ray pinhole picture. These pictures show that the collapsed plasma is axially inhomogeneous, i.e., He-like argon, represented by the X-ray pinhole picture, forms in hot spots along the axis and lower ionization stages fill in the regions between the hot spots. A spectrum taken with a curved crystal instrument is presented. This spectrum shows the argon XVII, He-like resonance and intercombination lines, along with satellite structures from argon X to XVI. Another part of the spectrum contains weak H-like lines. DOE

N84-32200# Language Services, Knoxville, Tenn.
ELECTROMAGNETIC THEORY OF AN ANTENNA FOR ICR HEATING OF A PLASMA IN TOKAMAKS
V. L. Vdovin and I. V. Kurchatov 1984 25 p refs Transl. into ENGLISH of rept. IAE-3728/8 I. V. Kurchatov Atomic Energy Inst., Moscow, 1983 24 p
(Contract DE-AC05-84OR-21400)
(DE84-012988; ORNL-tr-5130; IAE-372/8) Avail: NTIS HC A02/MF A01

The present paper develops the electromagnetic theory of antenna for ICR heating of a plasma in Tokomaks. The basic numerical calculations for the INTOR reactor are given. The dependences of antenna impedance on its geometry and the plasma parameters were obtained. The substantial portion of the power transfered by the unretarded waves was discovered. This distortion of the spectrum is apparently substantial also with lower-hybrid heating of a grill is introduced into the Tokamak chamber in a special extension of the connecting piece or is projected toward the plasma beyond the first wall of the Tokamak. Measures for eliminating these slightly retarded waves are evaluated (the effects of the influence of short radial conductors are considered suppressed by the antiphase feeding of the adjacent feeders. The theory that was developed facilities calculating the antenna for the ion-cyclotron heating of the plasma of large-scale Tokamaks. DOE

N84-32036# Tokyo Denki Univ. (Japan). Dept. of Electronic Engineering.
ION-MOLECULE REACTIONS AND PLASMA PARAMETERS OF POSITIVE COLUMN IN OXYGEN GLOW DISCHARGE
T. Kaneda, Y. Ichikawa (Wright State Univ.), R. I. C. Wu (Wright State Univ.), and T. O. Tiernan (Wright State Univ.) *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 17-28 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32073# Joint Publications Research Service, Arlington, Va.
RESONANCE AND EDGE AMPLIFICATION OF AN ELECTRIC FIELD IN A PLASMA RESONANCE LAYER AND ACCELERATION OF PARTICLES AT PLASMA INHOMOGENEITIES Abstract Only
G. A. Askaryan and S. V. Bulanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 117 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 9, no. 20, 26 Oct. 1983 p 1243-1247 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32102# Joint Publications Research Service, Arlington, Va.
BREMSSTRAHLUNG FROM LONGITUDINAL PLASMA WAVES PRODUCED BY SUBTHERMAL ELECTRONS IN PLASMA Abstract Only
A. V. Akopyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 74-75 Transl. into ENGLISH from Izv. Akad. Nauk Armyansk. SSR: Fiz. (Yerevan, USSR), v. 19, no. 1, Jan. - Feb. 1984 p 15-19 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32103# Joint Publications Research Service, Arlington, Va.
ENERGY CHARACTERISTICS OF PLASMA GENERATED IN AIR NEAR TARGET BY RADIATION FROM CO2 LASER Abstract Only
G. G. Dolgov-Savelyev, V. A. Zhuk, A. M. Orishich, A. G. Ponomarenko, V. G. Posukh, and V. N. Snytnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 75 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk, USSR), no. 5(141), Sep. - Oct. 1983 p 3-7 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32104# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF DENSE PLASMA COLUMN IN STRONG MAGNETIC FIELDS AND ITS DIAGNOSIS BY LASER METHODS Abstract Only
A. V. Arzhannikov, V. S. Burmasov, L. N. Vyacheslavov, and V. S. Koydan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 79-80 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 1, Jan. - Feb. 1984 p 175-182 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32105# Joint Publications Research Service, Arlington, Va.
PLASMA BEAM INSTABILITY OF BOUNDED ELECTRON BEAM IN WEAK MAGNETIC FIELD Abstract Only
A. A. Ivanov and N. G. Popkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 80 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 1, Jan. - Feb. 1984 p 106-111 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32106# Joint Publications Research Service, Arlington, Va.
HEAT TRANSFER BY RADIATION IN HYDROGEN PLASMA Abstract Only
G. A. Kovalskaya, V. G. Sevastyanenko, and R. I. Soloukhin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 83 Transl. into ENGLISH from Inzh.-Fiz. Zh. (Minsk), v. 45, no. 6, Dec. 1983 p 977-983 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-32201*# Eloret Corp., Mountain View, Calif.
IN-SITU TEM INVESTIGATIONS OF GRAPHIC-EPITAXY AND SMALL PARTICLES Final Report, 1 Jan. - 31 Dec. 1982
K. Heinemann Jan. 1983 68 p refs
(Contract NCC2-171)
(NASA-CR-166593; NAS 1.26:166593) Avail: NTIS HC A04/MF A01 CSCL 20L

Palladium was deposited inside a controlled-vacuum specimen

chamber of a transmission electron microscope (TEM) onto MgO and alpha-alumina substrate surfaces. Annealing and various effects of gas exposure of the particulate Pd deposits were studied in-situ by high resolution TEM and electron diffraction. Whereas substrate temperatures of 500 C or annealing of room temperature (RT) deposits to 500 C were needed to obtain epitaxy on sapphire, RT deposits on MgO were perfectly epitaxial. For Pd/MgO a lattice expansion of 2 to 4% was noted; the highest values of expansion were found for the smallest particles. The lattice expansion of small Pd particles on alumina substrates was less than 1%. Long-time RT exposure of Pd/MgO in a vacuum yielded some mobility and coalescence events, but notably fewer than for Pd on sapphire. Exposure to air or oxygen greatly enhanced the particle mobility and coalescence and also resulted in the flattening of Pd particles on MgO substrates. Electron-beam irradiation further enhanced this effect. Exposure to air for several tens of hours of Pd/MgO led to strong coalescence. Author

N84-32202*# Roberts Associates, Inc., Vienna, Va.
MATHEMATICAL MODEL FOR A SIMPLIFIED BRIDGMAN-STOCKBARGER CRYSTAL GROWING SYSTEM Final Report, 17 May - 16 Jun. 1984
Glyn O. Roberts 3 Jul. 1984 97 p refs
(Contract NAS8-35983)
(NASA-CR-171108; NAS 1.26:171108; RAI-84-B-4) Avail: NTIS HC A05/MF A01 CSCL 20B

A simplified computer model for Bridgman-Stockbarger crystal growth is described. The model neglects melt convection and solute effects, but includes thermal conduction in the ampoule, melt, and crystal, and the determination of the curved moving crystal-melt interface. The key to the numerical method is the use of a nonuniform computational mesh which moves with the interface, so that the interface is a mesh surface. In addition, implicit methods were used to allow large time-steps without loss of stability or accuracy. Plans to upgrade the model to include convection and solute effects are outlined. The model and computer code were designed with this upgrade in mind. Numerical results for the interface shape and temperature distribution in steady-state crystal growth are presented, for a material with distinct thermal conductivities in the crystal and melt. These results are for three different geometries. The computational meshes are also displayed. Author

N84-32203# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
X-RAY DIFFRACTION STUDY OF THE PHASE COMPOSITION OF THE CRYSTALLIZATION MEDIUM AND INCLUSIONS IN SYNTHETIC DIAMONDS
B. I. Zadneprovskii 1983 10 p refs Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 3, 1982 p 15-20
(CSIR-Trans-1723) Avail: NTIS HC A02/MF A01

The phase composition of monocrystalline inclusions in diamond was investigated by using X-ray diffraction. Approximately 100 monocrystals synthesized via the nickel manganese graphite system were examined in order to identify the various stages involved in synthetic diamond growth. Two types of inclusions predominated in the crystals investigated: filamentous inclusions and discrete, dark colored inclusions of irregular shape. R.S.F.

N84-32204# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH Quarterly Technical Report, 1 Aug. - 31 Oct. 1983
A. L. McWhorter 15 Nov. 1983 86 p
(AF Proj. 649L)
(AD-A142991; Rept-1983-4; ESD-TR-83-223) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 August through 31 October 1983. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology. Funding is primarily provided by the Air Force, with additional support provided by the Army, DARPA, Navy, NASA, and DOE. Author (GRA)

N84-32205# Hughes Research Labs., Malibu, Calif.
EFFECTS OF CYCLOHEXYL GROUPS AND ORTHO-SUBSTITUENTS ON THE VISCOSITY OF ESTER LIQUID CRYSTAL COMPONENTS
J. D. Margerum, S. M. Wong, J. E. Jensen, C. I. VanAst, and A. M. Lackner Jun. 1984 27 p
(Contract N00014-82-C-0512)
(AD-A143028; HRL-TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/4

Structural effects on the relative viscosity of liquid crystal ester components are studied by capillary flow viscosity measurements of each components as an additive (10 to 25%) in a standard nematic mixture of short length 4-alkoxyphenyl 4-alkylbenzoates. An approximate class viscosity at 25 deg C is calculated and assigned to each additive component, indicative of its viscosity contribution in the environment of the phenyl benzoate mixture. Studies are made on the viscosity effects of replacing benzene rings with cyclohexane rings, and of using various ortho-substituents on phenyl groups. All of the additive components are esters or thioesters, including several newly synthesized compounds. GRA

N84-32206# Hughes Research Labs., Malibu, Calif.
LIQUID CRYSTAL MATERIALS FOR MATRIX DISPLAYS Final Report, 1 Jun. 1982 - 30 Nov. 1983
J. D. Margerum and A. M. Lackner Jun. 1984 144 p
(Contracts N00014-82-C-0512; N00014-79-C-0524; N00014-81-C-0307)
(AD-A143039) Avail: NTIS HC A07/MF A01 CSCL 07/4

Studies are made on several basic areas relating to the properties and behavior of liquid crystal (LC) mixtures for use in dynamic scattering (DS) electro-optical applications, particularly in dc-activated matrix displays at elevated temperatures. These studies include the analysis of the major factors affecting DS characteristics, the development of methods to formulate new LC mixtures with desirable predicted properties for DS displays, investigations of structural effects on the viscosity of LC components of negative dielectric anisotropy, and examination of the dc-DS properties and lifetime of improved LC mixtures used at elevated temperatures. New LC eutectic mixtures with wide nematic ranges are shown to be operable in the 20 to 71 deg C range, with good storage stability in the -60 to 80 deg C. GRA

N84-32207# Hughes Research Labs., Malibu, Calif.
IMPROVED MATERIALS FOR DC DYNAMIC SCATTERING AT ELEVATED TEMPERATURES
A. M. Lackner and J. D. Margerum Jun. 1984 41 p Presented at the 10th Intern. Liquid Crystall Conf., York, Engl., 15-21 Jul. 1984
(Contract N00014-82-C-0512; NR Proj. 051818)
(AD-A143076; HRL-TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/2

Liquid crystal (LC) mixtures and a sealant suitable for dc-activated dynamic scattering (DS) matrix displays are developed for wide range storage temperature (-60 to 80 deg C) and for elevated temperature operation. Three improved eutectic nematic mixtures are formulated with nematic ranges (undoped) of 0 to 74, -4 to 82, and -13 to 78 deg C, with flow viscosities of 31, 32, and 36 cP, respectively. Several types of sealants are tested in contact with LC and are evaluated according to the level of contamination they introduce at elevated temperature. One UV-curved sealant shows no apparent degradation effects after more than 18000 hours of 100 deg C heating with an undoped ester LC in a vacuum-filled test cell made with this sealant. The viscosity, dielectric anistropy, conductivity anisotropy, and dc-activated DS effects are studied as a function of temperature for one of the mixtures. Response times of DS as a function of temperature (25 deg C to 65 deg C) and cell thickness are also studied. GRA

N84-32208# Sandia Labs., Albuquerque, N. Mex.
IRRADIATION OF OPTIMIZED, MBE GROWN, AlGaAs RADIATION HARDENED PHOTODIODE
J. J. Wiczer, T. A. Fischer, L. R. Dawson, G. C. Osbourn, T. E.

Zipperian, and C. E. Barnes Mar. 1984 5 p refs Presented at 21th IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Colorado Springs, 22 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-008034; SAND-84-0525C; CONF-840712-2) Avail: NTIS HC A02/MF A01

An AlGaAs/GaAs double heterojunction photodiode structure designed to be less susceptible to the disrupting effects of ionizing radiation pulses was fabricated and tested. The photodiode was an optimized structure, fabricated with the molecular beam epitaxy process for improved electrical and optical properties. Pulsed ionizing radiation testing included: irradiations with an 18 MeV electron beam from a linear accelerator, exposures to 1 to 10 MeV X-ray from the Hermes machine, and simultaneous neutron and gamma exposure from the SPR-III pulsed reactor. DOE

N84-32209# Sandia Labs., Albuquerque, N. Mex.
SUPERLATTICE STRUCTURES GROWN BY MOLECULAR BEAM EPITAXY
L. R. Dawson 1984 25 p refs Presented at the Materials for Future Energy Systems Conf., Washington, D.C., 1 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-011288; SAND-84-0111C; CONF-840570-2) Avail: NTIS HC A02/MF A01

Recent advances in the preparation of superlattice structures have made it possible to tailor the optical, electrical and metallurgical properties of semiconductors in ways that could strongly impact the performance of advanced concept, multijunction photovoltaic devices. The interfacial strain in lattice-mismatched superlattices (strained-layer superlattices) offers a method of eliminating the large numbers of misfit defects usually present in the mismatched bulk alloy semiconductors needed for optimum high performance cells. Extensive characterization of such structures indicates excellent optical, electrical, and metallurgical quality in spite of the large number of strained interfaces. Junction photodetectors fabricated from such materials show peak internal quantum efficiency in excess of 70%. DOE

N84-32210# Argonne National Lab., Ill. Materials Science and Technology Div.
POINT DEFECTS AND DIFFUSION MECHANISMS IN THE MONOXIDES OF THE IRON-GROUP METALS
N. L. Peterson 1984 24 p refs Presented at the Indo/US Workshop on Diffusion in Solids, Bombay, 9-14 Jan. 1984
(Contract W-31-109-eng-38)
(DE84-012105; CONF-840145-2) Avail: NTIS HC A02/MF A01

The properties of point defects and the mechanisms of cation diffusion in NiO, CoO, and FeO are reviewed. The method of analysis and the results are presented in some detail for NiO to demonstrate how results from measurements of electrical conductivity, deviation from stoichiometry, tracer diffusion, and chemical diffusion are used to obtain concentrations and mobilities of defects. The results of similar analyses are presented for CoO and FeO; these results demonstrate the importance of defect clustering and defect-defect interactions at large defect concentrations. DOE

N84-32211# Naval Research Lab., Washington, D. C.
STUDIES OF HYDROGENATED AMORPHOUS SILICON Yearly Report, 15 Aug. 1982 - 15 Mar. 1984
S. G. Bishop and W. E. Carlos 1984 22 p refs
(Contract DE-AI02-80CS-83116)
(DE84-011888; DOE/CS-83116/T1) Avail: NTIS HC A02/MF A01

As in the case of crystalline semiconductors, the incorporation of group III elements such as boron into hydrogenated amorphous silicon (a-Si:H) produces p-type doping. Unlike the crystalline case, the doping efficiency in a-Si:H is quite low and therefore relatively large amounts of boron must be incorporated into the a-Si:H to achieve the desired results. The local structural environment of boron was characterized using nuclear magnetic resonance. The role of intrinsic and extrinsic defects in these films was addressed. Electron paramagnetic resonance was the primary probe for this work. Films grown by both glow discharge and chemical vapor deposition were studied. Dopants in microcrystalline films were also examined to learn what fraction of the dopant atoms (phosphorous or boron) reside in the microcrystals and what fraction reside in the amorphous matrix. DOE

N84-32212# Ames Lab., Iowa.
MAGNETIC IMPURITY SCATTERING IN IN SITU SUPERCONDUCTORS
D. K. Finnemore, H. C. Yang, V. G. Kogan, and S. L. Miller 1983 8 p refs Presented at the Cryogenic Eng. Conf., Colorado Springs, 15 Aug. 1983
(Contract W-7405-eng-82)
(DE84-012835; IS-M-466; CONF-830841-35) Avail: NTIS HC A02/MF A01

Measurements of ac losses for in situ prepared superconducting composites consistently show loss values higher than those observed for bronze process materials. To get the measured ac loss, an effective filament size is needed in the range of 20 to 50 (MU)m. The origin of this coupling and methods of controlling it are discussed. Proximity coupling by the introduction of magnetic impurities into the normal metal barrier is controlled. Results of a study of the model system Pb-(AgMn)-Pb to understand all of the basic physics involved and to learn quantitatively the effects of magnetic impurity scattering in the N layer are presented. Because both magnetic and non-magnetic scattering are important in the Cu-Nb3Sn systems, both Mn and Al to the Ag to determine the effects of both the magnetic scattering rate (pi/sub s/(-1)) and non-magnetic scattering rate (pi/sub N/(-1)). DOE

N84-32213# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ENERGY REDISTRIBUTION IN DIATOMIC MOLECULES ON SURFACES
M. Asscher and G. A. Somorjai Apr. 1984 27 p refs Presented at the 17th Symp. on Quantum Chem. and Biochem.: Dyn. of Molecule-Surface Interaction, Jerusalem, 30 Apr. - 3 May 1984 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE84-011442; LBL-17670; CONF-8404166-1) Avail: NTIS HC A03/MF A01

Translational and internal degrees of freedom of a scattered beam of NO molecules from a Pt(111) single crystal surface were measured as a function of scattering angle and crystal temperature in the range 450 to 1250 K. None of the three degrees of freedom were found to fully accommodate to the crystal temperature, the translational degree being the most accommodated and the rotational degree of freedom the least. A precursor state model is suggested to account for the incomplete accommodation of translational and vibrational degrees of freedom as a function of crystal temperature and incident beam energy. The vibrational accommodation is further discussed in terms of a competition between desorption and vibrational excitation processes, thus providing valuable information on the interaction between vibrationally excited molecules and surfaces. Energy transfer into rotational degrees of freedom is qualitatively discussed. DOE

N84-32214# Argonne National Lab., Ill.
NONEQUILIBRIUM SEGREGATION AND PHASE INSTABILITY IN ALLOY FILMS DURING ELEVATED-TEMPERATURE IRRADIATION IN A HIGH-VOLTAGE ELECTRON MICROSCOPE
N. Q. Lam and P. R. Okamoto May 1984 37 p refs Presented at the 12th Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18-20 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-013423; CONF-840604-7) Avail: NTIS HC A03/MF A01

The effects of defect-production rate gradients, caused by the radial nonuniformity in the electron flux distribution, on solute segregation and phase stability in alloy films undergoing high-voltage electron-microscope (HVEM) irradiation at high temperatures are assessed. Two-dimensional (axially symmetric) compositional redistributions were calculated, taking into account both axial and transverse radial defect fluxes. It was found that when

highly focused beams were employed radiation-induced segregation consisted of two stages: dominant axial segregation at the film surfaces at short irradiation times and competitive radial segregation at longer times. The average alloy composition within the irradiated region could differ greatly from that irradiated with a uniform beam, because of the additional atom transport from or to the region surrounding the irradiated zone under the influence of radial fluxes. Damage-rate gradient effects must be taken into account when interpreting in-situ HVEM observations of segregation-induced phase instabilities. The theoretical predictions are compared with experimental observations of the temporal and spatial dependence of segregation-induced precipitation in thin films of Ni-Al, Ni-Ge and Ni-Si solid solutions. DOE

N84-32215# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
THE SELECTIVE EPOXIDATION OF ETHYLENE CATALYZED BY SILVER: MECHANISTIC DETAILS REVEALED BY SINGLE-CRYSTAL STUDIES
Charles T. Campbell 1984 16 p refs Presented at the Natl. Symp. of the American Chemical Society, Philadelphia, 26-31 Aug. 1984 Submitted for publication
(Contract W-7405-eng-36)
(DE84-009987; LA-UR-84-1041; CONF-840805-2) Avail: NTIS HC A02/MF A01

The selective oxidation of ethylene to ethylene epoxide (C2H4 + 1/2 O2 yields C2H4O) over Ag is a simple prototype for the entire class of kinetically-controlled, selective oxidation reactions. The steady-state kinetics and selectivity of this reaction were studied on clean, well-characterized single-crystal surfaces of silver by using a special apparatus which allows rapid (approx. 20 s) transfer between a high-pressure catalytic microreactor and an ultra-high vacuum surface analysis (AES, XPS, LEED, TDS) chamber. These single-crystal studies provide considerable new insight into: the reaction pathway through molecularly adsorbed O2 and C2H4, the structural sensitivity of real silver catalysts, and the role of chlorine adatoms in promoting catalyst selectivity. DOE

N84-31440# Joint Publications Research Service, Arlington, Va.
LARGE-SIGNAL AMPLIFIER BASED ON FERRIMAGNETIC ECHO Abstract only
Ye. A. Yegorov and V. A. Kozlov *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 25-26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31446# Joint Publications Research Service, Arlington, Va.
INFRARED ELLIPSOMETER METHOD FOR DETERMINATION OF PARAMETERS OF THIN EPITAXIAL STRUCTURES WITH BURIED LAYER: SPECIMENS WITH DULL INACTIVE SURFACE Abstract only
E. S. Lonskiy and V. P. Vasilyev *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 41 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 13, no. 1, Jan. 1984 p 74-83 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

N84-31453# Joint Publications Research Service, Arlington, Va.
MODELLING OF TRANSFER PROCESSES IN MONOPOLAR SEMICONDUCTOR STRUCTURES WITH SUBMICRON DIMENSIONS Abstract only
A. A. Kokin and V. I. Tolstikhin *In its* USSR Rept.: Electron. and Elec. Engr. (JPRS-UEE-84-008) 11 Jun. 1984 p 58 Transl. into ENGLISH from Mikroelektron. (Moscow), vol. 13, no. 1, Jan. 1984 1984 p 120-125 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32039# Tokyo Denki Univ. (Japan).
PROPERTIES OF BUBBLE DOMAINS IN CHOLESTERIC-NEMATIC MIXTURES
Chikao Obayashi *In its* Res. Rept. of the Fac. of Eng., No. 31 Dec. 1983 p 43-50 refs (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32041# Tokyo Denki Univ. (Japan).
IMPROVEMENT IN QUALITY OF SILICON-BASED AMORPHOUS FILMS
K. Ebara, T. Homma, Y. Fukami, Y. Kobayashi, Y. Abe, and T. Aono *In its* Res. Repts. of the Fac. of Eng., No. 31 Dec. 1983 p 63-92 refs In JAPANESE; ENGLISH summary (For primary document see N84-32034 21-70)
Avail: NTIS HC A07/MF A01

N84-32050# Joint Publications Research Service, Arlington, Va.
AMPLIFICATION OF TRAVELING MAGNETOSTATIC WAVES BY PARAMETRIC PUMPING Abstract Only
A. V. Bashkovskiy, V. I. Zubkov, I. V. Krutsenko, and G. A. Melkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 21-22 Transl. into ENGLISH from Pisma Zh. Eksperim. Teoreticheskoy Fiz. (Moscow), v. 39, no. 3, 19 Feb. 1984 p 124-126 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32051# Joint Publications Research Service, Arlington, Va.
CALCULATING ELECTRIC FIELDS IN SEMICONDUCTOR STRUCTURES WHEN SINGULARITIES ARE PRESENT Abstract Only
V. L. Kulchitskiy, V. P. Plakhotnyy, A. K. Smovzh, and S. V. Svechnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 23-24 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. A Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 12, Dec. 1983 p 39-41 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32052# Joint Publications Research Service, Arlington, Va.
ELECTRICAL CHARACTERISTICS OF METAL-DIELECTRIC-SEMICONDUCTOR SYSTEMS PRODUCED ON EPITAXIAL SILICON STRUCTURES WITH VARIOUS DIELECTRICS Abstract Only
O. F. Fomicheva, La. A. Otavina, A. M. Sverdlova, and G. G. Kapshtal *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 29 Transl. into ENGLISH from Poverkhnost: Fiz., Khim., Mekhan. (Moscow), no. 1, Jan. 1984 p 80-83 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32071# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF STRONG NONLINEAR-OPTICS EFFECTS IN LIQUID CRYSTALS Abstract Only
S. D. Darbin, S. M. Arakelyan, M. M. Cheung, and Y. R. Shen *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 99 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Fiz. (Moscow), v. 47, no. 12, Dec. 1983 p 2464-2475 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

N84-32084# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EFFECTS IN STRONG FIELD OF SINGLE CRYSTALS Abstract Only
V. V. Lasukov and S. A. Vorobyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 10 Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (Moscow), v. 86, no. 1, Jan. 1984 p 94-99 Original language document previously announced in IAA as A84-25607 (For primary document see N84-32081 21-70)
Avail: NTIS HC A06/MF A01

N84-32085# Joint Publications Research Service, Arlington, Va.
NONEQUILIBRIUM OPTICAL AND ACOUSTIC PHONONS IN SEMICONDUCTORS Abstract Only
Yu. G. Gurevich and O. L. Mashkevich *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-005) 15 Aug. 1984 p 13 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 1, Jan.

p 24-40 (For primary document see N84-31427 21-31)
Avail: NTIS HC A04

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-32216# Argonne National Lab., Ill. Chemical Technology Div.
PREDICTIONS OF ENTROPIES OF MOLECULES AND LIQUIDS
Milton Blander and Christopher Stover Apr. 1984 18 p refs Presented at the 4th Intern. Conf. on High Temp. Sci. HYTHERM, Santa Fe, N. Mex., 2 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-010504; CONF-8404110-3) Avail: NTIS HC A02/MF A01

A reanalysis of classical partition functions for vapor molecules leads to a modified equation for the prediction of relative values of nonelectronic entropies in terms of atomic masses and size parameters. Correspondence of predictions with tabulated data on nonhydrogenic molecules of up to seven atoms is very good. Theoretical integrals for diatomic and triatomic molecules were evaluated for a simple ionic potential; the results are in good agreement with measured entropies of ionic and nonionic molecules indicating that the theory permits one to predict absolute values of entropies for any type of molecule. Differences between bent and linear triatomic molecules appear to be related more to bond character than to molecular geometry. The application of equations to alkali halide liquids requires a correction term which is related to the observed penetration of ions into the coordination shell of like charged ions. The semi-empirical use of the cube root of the molar volume as an effective size parameter leads to very good correlations of the entropies of all the alkali halides. DOE

N84-32217# Brookhaven National Lab., Upton, N. Y.
NUMERICAL CALCULATIONS IN QUANTUM FIELD THEORIES
C. Rebbi 1984 39 p refs Presented at 23rd Intern. Univ. fur Kernphys., Schladming, Austria, 20 Feb. 1984
(DE84-010892; BNL-34642; CONF-840281-1) Avail: NTIS HC A03/MF A01

Four lecture notes are included: (1) motivation for numerical calculations in Quantum Field Theory; (2) numerical simulation methods; (3) Monte Carlo studies of Quantum ChromoDynamics; and (4) systems with fermions. DOE

N84-32218# Missouri Univ., Rolla.
CALORIMETRIC DETERMINATION OF THE THERMODYNAMIC BEHAVIOR OF REVERSIBLE LIQUID-PHASE REACTIONS FOR USE IN ENERGY STORAGE Ph.D. Thesis
Patrick Francis Thompson 1983 99 p refs
(Contract DE-FG47-81R7-01250)
(DE84-010437; DOE/R7-01250/T3) Avail: NTIS HC A05/MF A01

A calorimetric method of determining equilibrium mole fractions of labile species that participate in reversible, liquid-phase reactions was developed. This technique relies on the fact that a reactant-solvent mixture of a specific composition shifts the equilibrium neither to the left nor to the right, and thus will neither absorb nor generate heat when injected into an equilibrium mixture. Using the open-system energy balance, initial mole fraction values for each constituent, and the experimentally determined composition of the reactant-solvent mixture which causes no reaction, the equilibrium mole fraction of each constituent is determined. DOE

N84-32219# Oak Ridge National Lab., Tenn. Engineering Technology Div.
NONLINEAR ANALYSIS OF STIRLING ENGINE THERMODYNAMICS
R. D. Banduric and N. C. J. Chen Jun. 1984 76 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013493; ORNL/CON-154) Avail: NTIS HC A05/MF A01

Numerical solutions to a simplified mathematical formulation for Stirling engine thermodynamics, including some major loss mechanisms and their interactions, are presented. Numerically accurate solutions to the nonlinear equations for verification of a simplified linear analysis recently developed at Oak Ridge National Laboratory are presented. The formulation requires that the piston motions be specified; that is, it does not include the dynamics of free pistons. The equations of the formulation were numerically solved using a standard IBM software package, called the Continuous System Modeling Program, that basically involves numerical integration. The results were used to show the effects of four major loss mechanisms on the performance parameters of the RE-1000 free-piston Stirling engine. These losses are: adiabatic cylinder effects, transient heat transfer, pressure drop, and seal leakage. The performance parameters calculated were power output and efficiency. Some discussion of the results and a further analysis of this engine model are also presented. DOE

N84-32075# Joint Publications Research Service, Arlington, Va.
COOLING OF SEMIINFINITE BODY UNDER CONDITIONS OF NONLINEAR HEAT TRANSFER AT SURFACE Abstract Only
Yu. I. Babenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-84-003) 9 Jul. 1984 p 130 Transl. into ENGLISH from Inzhenerno-Fiz. Zh. (Minsk), v. 45, no. 4, Oct. 1983 p 633-635 (For primary document see N84-32043 21-70)
Avail: NTIS HC A08/MF A01

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-32220*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
GRADUATE ENGINEERING RESEARCH PARTICIPATION IN AERONAUTICS Annual Progress Report, 1 Sep. 1983 - 31 Aug. 1984
A. Sidney Roberts, Jr. Aug. 1984 18 p
(Grant NGR-47-003-052)
(NASA-CR-173849; NAS 1.26:173849) Avail: NTIS HC A02/MF A01 CSCL 05I

Graduate student engineering research in aeronautics at Old Dominion University is surveyed. Student participation was facilitated through a NASA sponsored university program which enabled the students to complete degrees. Research summaries are provided and plans for the termination of the grant program are outlined. Project topics include: Failure modes for mechanically fastened joints in composite materials; The dynamic stability of an earth orbiting satellite deploying hinged appendages; The analysis of the Losipescu shear test for composite materials; and the effect of boundary layer structure on wing tip vortex formation and decay. S.B.

N84-32221*# Hampton Inst., Va.
SUMMER FACULTY FELLOWSHIP PROGRAM, 1984
John H. Spencer, comp. Sep. 1984 120 p refs
(Grant NGT-47-020-800)
(NASA-CR-172409; NAS 1.26:172409) Avail: NTIS HC A06/MF A01 CSCL 05I

Since 1964, the National Aeronautics and Space Administration (NASA) has supported a program of summer faculty fellowships for engineering and science educators. In a series of collaborations between NASA research and development centers and nearby universities, engineering faculty members spend 10 or 11 weeks working with professional peers on research. The Summer Faculty Program Committee of the American Society of Engineering Education supervises the programs. Objectives: (1) to further the professional knowledge of a qualified between participants and

NASA; (3) to enrich and refresh the research and teaching activities of participants institutions; and (4) to contribute to the research objectives of the NASA center. Program Description: College or university faculty members will be appointed as research fellows to spend 10 weeks in cooperative research and study at the NASA-Langley Research Center. The fellow will devote approximately 90 percent of the time to a research problem and the remaining time to a study program. The study program will consist of lectures and seminars on topics of general interest or that are directly relevant to the fellow's research project. The lecturers and seminar leaders will be distinguished scientists and engineers from NASA, education, or industry. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-32222 British Library Lending Div., Boston Spa (England).
ONE METHOD OF ASSESSING THE VALIDITY OF ORGANIZATIONAL-SYSTEMS MODELLING
A. T. Asherov Apr. 1984 9 p Transl. into ENGLISH from Izv. (USSR) p 129-133
(BLL-M-35605-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A method of assessing the validity of a morphological description of organizational systems is proposed. An example of such an assessment, the control of a works, based on a published model is given. Author

N84-32223# American Defense Preparedness Association, Arlington, Va.
PROCEEDINGS OF THE 5TH INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE VOLUME 1
16 Nov. 1983 395 p Held at Washington, D.C. on November 14-15, 1983
(AD-A142774) Avail: NTIS HC A17/MF A01 CSCL 05/9

These Proceedings of the 5th Interservice/Industry Training Equipment Conference present a record of technology interchange, training management issues, and user views from what has become the premier annual military/industry training conference. Key decision makers at all levels of the government and industry will be meeting again to consider vital issues related to the training of our Nation's Armed Forces. Increased Readiness Through Training is the theme of the 1983 Conference, and this can be made reality through the cooperative efforts of all government and industry Conference participants. For individual titles, see N84-32224 through N84-32265.

N84-32224# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
A WIDE FIELD-OF-VIEW CRT PROJECTION SYSTEM WITH OPTICAL FEEDBACK FOR SELF ALIGNMENT c74
P. Lyon *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 1-9 (For primary document see N84-32223 21-81)
(AD-P003447) Avail: NTIS HC A17/MF A01 CSCL 20/6

Evans & Sutherland has developed a multi-channel CRT projection system. This system uses microprocessor technology with optical feedback to provide self-alignment for color-hue, intensity, color-convergence, geometry, and focus. By replacing drift-prone analog correction circuits with digital circuits and D/A converters, system drifts are limited to gain and offset errors. These errors are optically detected and corrected in real-time by the microprocessor. Geometry drifts can be detected and corrected to within 1/4 of a pixel. Because this projection system is CRT based, image generator, lens, and projection angle induced distortions as large as 30% can be corrected by the projector's digital electronics. The projection system self-alignment capabilities together with edge matching make possible the tiling of multiple channels. This facilitates improved brightness and resolution over wide fields-of-view. A six channel system, with 30 degree by 30 degree fields-of-view for each channel, using a 12 foot radius screen of unity gain yields 7 ft-lambert brightness with better than 3 arc-minute resolution. Author (GRA)

N84-32225# Goodyear Aerospace Corp., Akron, Ohio. Simulator Systems Engineering Div.
CLOSING THE GAP BETWEEN AIRCRAFT AND SIMULATOR TRAINING WITH LIMITED FIELD-OF-VIEW (LFOV) VISUAL SYSTEMS c09
W. P. Leavy and M. Fortin (Rediffusion Simulation, Inc., Akron, Ohio) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 10-18 (For primary document see N84-32223 21-81)
(AD-P003448) Avail: NTIS HC A17/MF A01 CSCL 05/9

A limited field-of-view (LFOV) visual system for the F-15 flight simulator (FS) - developed and built by Goodyear Aerospace Corporation - would greatly increase the already proven training capability of the FS. The current F-15 FS, having no visual system, readily handles all its assigned instrument and emergency procedure training tasks. The LFOV system - capable of adapting to cost parameters - will enhance the overall training capability of the F-15 FS by adding out-the-window visual cues. The overall training capability, particularly in the visual air-to-air and air-to-ground modes, is expected to be significantly improved by the addition of the LFOV system. The data base for the LFOV system is intended to support air-to-ground, air-to-air, and normal airfield operations. Air Force instructor pilots will evaluate the LFOV for a three-month period by following specific evaluation plans and by using strict grading procedures. Author (GRA)

N84-32226# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.
IMAGE GENERATOR ARCHITECTURES AND FEATURES c09
R. Latham *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 19-26 (For primary document see N84-32223 21-81)
(AD-P003449) Avail: NTIS HC A17/MF A01 CSCL 20/6

In order to meet user requirements, tradeoffs are made in the implementation of the four functions (scene management, prioritization, geometric processing, and video processing) that comprise a digital image generation system of the sort used for flight training. This paper discusses how different approaches to image generator architecture affect the features apparent to the user. Among the architectural variations discussed are programmable versus pipelined geometric processing, and four variations of video processor (scanline, reverse-priority-ordered frame buffering, priority-ordered frame buffering, and distance sensitivity, and the implementation of anti-aliasing, texture, and translucency features, among others. Understanding the tradeoffs involved will help designers and users better meet the requirements of a training task. Author (GRA)

N84-32227# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
PILOT ORIENTED PERFORMANCE MEASUREMENT c53
J. DeMaio, H. H. Bell, and J. Brunderman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 27-31 (For primary document see N84-32223 21-81)
(AD-P003450) Avail: NTIS HC A17/MF A01 CSCL 05/9

Flight simulators provide a complete quantitative record of a pilot's flying performance. Evaluating this record is complicated by the volume of data and by its fine detail, dozens of flight parameters, sampled many times per second. Automated performance measurement systems (APMS) reduce the volume of data to an amount which is manageable and understandable. The usual APMS is aircraft state oriented. The APMS keys on aircraft state (e.g., X-Y position, bank angle) to define intervals over which performance data are integrated. This PAMS is relatively insensitive to pilots' intentions and so may average performances which had differing objectives, based only on their having occurred at the

same point during the task sequence. An alternative APMS has been developed which is piloted oriented. This APMS defines measurement intervals based on control inputs. Control inputs are identified by discrete changes in flight path. These intervals are psychologically relevant in that they begin with a goal-directed control input and end with a countervailing input. By relating performance in the pilot defined intervals to state defined intervals, it is possible to quantify performance on given flight segments (e.g., a level turn), and to specify factors which lead to a given level of performance. Author (GRA)

N84-32228# McDonnell-Douglas Electronics Co., St. Charles, Mo.
NEW CONCEPTS IN AIRCREW TRAINING USING COMPUTER GENERATED IMAGERY: A STUDY REPORT **c53**
D. Hauck and M. Verstegen *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 32-38 (For primary document see N84-32223 21-81)
(AD-P003451) Avail: NTIS HC A17/MF A01 CSCL 05/9

The results of a study of the use of computer generated imagery in non-traditional training techniques are reported. These techniques complement and extend the role of a simulator from that of aircraft replicator to that of a training device. The study had three primary objectives: (1) exploit the flexibility of CGI to generate new concepts in aircrew training methods; (2) develop and demonstrate examples of these concepts; and (3) perform exploratory testing of the examples to assess their effectiveness and pilot acceptance. For future study, the concept of using the simulator as a specific visual task trainer is discussed.
Author (GRA)

N84-32229# Denver Research Inst., Colo.
ON-LINE TASK ANALYSES IN MAINTENANCE SIMULATION **c01**
J. J. Richardson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 39-46 (For primary document see N84-32223 21-81)
(Contract F33615-81-C-0006)
(AD-P003452) Avail: NTIS HC A17/MF A01 CSCL 05/9

The Air Force Human Resources Laboratory is currently sponsoring a project to investigate the costs and benefits of interactive, computer-based simulation in support of avionics maintenance training, utilizing a video disc picture data base to represent the actual equipment. The focus is on simulations which support the development of project is the use of on-line task analyses. An on-line task analysis is defined as a computer-resident data base representing the set of goals and actions employed in accomplishing a task. Goals are divided into subgoals or actions, serving to decompose the troubleshooting problem into simpler problems. Actions involve direct manipulation of equipment. On-line task analyses may be useful in the development and delivery of quality, cost-effective maintenance simulations. Four benefits of on-line task analyses and a methodology for the development of these analyses are presented. The associated potential training effectiveness gains and cost savings are currently being tested empirically. Author (GRA)

N84-32230# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
A COMPARISON OF SIMULATOR PROCUREMENT/PROGRAM PRACTICES: MILITARY VERSUS COMMERCIAL
J. S. Hussar *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 47-59 (For primary document see N84-32223 21-81)
(AD-P003453) Avail: NTIS HC A17/MF A01 CSCL 05/1

The costs of complex military flight simulators have been steadily rising, causing all concerned to carefully evaluate procurement and life-cycle costs of these devices. In making these evaluations, the issue is often raised that commercial airline simulators of comparable quality can be procured for less money and with shorter schedules. This paper provides a comparison of military and commercial procurement methods, concentrating on the major differences between them. It analyzes the key discriminators between military and commercial contract requirements which collectively cause simulator procurement and program practices to be so different, and costs to vary so widely, when the resultant flight simulators procured by both methods are highly regarded for their training capabilities. Recognizing that some of the military requirements are unique and necessary, this paper takes the position that military simulator procurement can utilize some of the methods employed in commercial procurements to reduce life-cycle costs. Author (GRA)

N84-32231# Boeing Military Airplane Development, Wichita, Kans.
CONCURRENCY OF DESIGN CRITERIA: A KEY TO TRAINER READINESS **c09**
J. Casperson and J. Jonas *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 60-63 (For primary document see N84-32223 21-81)
(AD-P003454) Avail: NTIS HC A17/MF A01 CSCL 05/9

The benefits associated with combat crew readiness are obvious. What may not be so obvious are the benefits associated with timely acquisition and availability of training and training devices. As new aircraft programs develop and present aircraft programs mature, the crews must either train on the operational equipment or wait until the associated trainers are developed or updated. If the trainers are developed and updated in concert with the aircraft program, the Air Force is provided not only with combat-ready crews at the correct time, but also at the correct cost. The key to keeping the training devices in concert with the aircraft is Concurrency Program. On the B-1B program, a complete concurrency program is being addressed. By complete, it is meant a program which addresses the two major issues associated with keeping the trainer concurrent with the aircraft. (1) Cost-effective development and distribution of the required design criteria data. (2) Inherent flexibility designed into the training device to accommodate changes in a cost-effective manner. Author (GRA)

N84-32232# Honeywell, Inc., West Covina, Calif.
DETERMINING COST AND TRAINING EFFECTIVENESS TRADEOFFS FOR TRAINER DESIGN: TEST OF AN EXPERIMENTAL MODEL **c09**
R. A. Wienclaw and J. Orlansky (IDA, Alexandria, Va.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 64-73 (For primary document see N84-32223 21-81)
(AD-P003455) Avail: NTIS HC A17/MF A01 CSCL 05/1

This paper reports the status of an ongoing project to develop a macro model describing the decisions involved in developing training equipment. The purpose of the model is to assist managers in making such decisions by providing information concerning the tradeoffs between the cost and effectiveness of training provided by different configurations and choices of equipment. The goals of the current phase of the study were to determine the feasibility of collecting data to empirically test the model and turn it into a practical tool to be used in making decisions relating to trainer design and development, and to perform a preliminary test of the model. Results of the field data collection led to the conclusion that the data necessary to test the model can be obtained. However, such measures need to be refined before the model can be turned into a practical tool. The preliminary test of the model performed in this study resulted in no major modifications of the model. Author (GRA)

N84-32233# Eagle Technology, Inc., Orlando, Fla.
COST-EFFECTIVE AND EFFICIENT MAINTENANCE TRAINING DEVICES: A USER ACCEPTED DESIGN PROCESS **c09**
W. F. Jorgensen and P. H. L. Brown *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 74-83 (For primary document see N84-32223 21-81)
(AD-P003456) Avail: NTIS HC A17/MF A01 CSCL 05/9

In response to a USAF need for cost-effective and efficient

training devices for the F-16 aircraft, a design process which was largely adapted from U.S. Air Force instructional design procedures was used and modified to ensure the efficient integration of these devices within the USAF training and logistics environments. Two specific and unique training device suites were conceptualized for the F-16 Fire Control and Armament systems. Physical and functional characteristics were specified for each training device suite to meet the specific hands-on training needs for Fire Control (AFSC 32X6C) and Weapons Control (AFSC 462XO) maintenance technicians. Author (GRA)

N84-32234# Air Force Human Resources Lab., Williams AFB, Ariz.
TRAINING CAPABILITIES: THE FACILITY PART OF THE EQUATION **c09**
J. S. Kamchi and W. Dube *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 84-91 (For primary document see N84-32223 21-81)
(AD-P003457) Avail: NTIS HC A17/MF A01 CSCL 13/13

The theme of increased readiness through training has an inherent assumption that adequate facilitates either exist, can be modified, or can be built to house computerized training devices. Too often adequate facilities do not exist or require long lead times to acquire. Training capabilities can become a myth to the realities of not having an adequate facility or of having modern training equipment fail because of facility deficiencies such as high temperatures and power spikes. But what are adequate facilities for computerized training devices, and how do we acquire them? This paper will review the time phasing and types of funding available within the Department of Defense for construction projects, design concepts of a flexible modular training building including security and environmental considerations. Without understanding the time phasing for acquisition of training facilities, the effectiveness of training devices can be reduced to zero. Author (GRA)

N84-32235# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
VISUAL CUEING EFFECTIVENESS: COMPARISON OF PERCEPTION AND FLYING PERFORMANCE **c53**
J. DeMaio, E. J. Rinalducci (Georgia Inst. of Tech.), R. Brooks, and J. Brunderman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 92-96 (For primary document see N84-32223 21-81)
(AD-P003458) Avail: NTIS HC A17/MF A01 CSCL 05/9

Growing emphasis on simulation of low altitude and air-to-air tactical scenarios has greatly increased the requirement for simulator visual systems capable of providing the pilot high-fidelity out-of-the-cockpit cues. Evaluation of visual system performance through simulator flying studies has been the primary measure of system quality. Such studies can be costly and time consuming, and often they provide equivocal results. The present set of experiments was conducted to investigate the use of psychophysical measurement methodology to provide quick, low-cost evaluation of the altitude cueing effectiveness of simulator visual displays. Experiment, 1 examined altitude perception in several visual environments. Experiment 2 was a validation effort, in which flying performance was evaluated in selected visual environments. In Experiment 1 pilots made altitude estimates based on static and dynamic presentations of visual displays containing texture and varying sizes of 3-dimensional objects. Best-fitting power functions were used to relate perceived altitude to actual altitude. In Experiment II Air force pilots flew the Advanced Simulator for Pilot Training F-16 through five selected visual environments at 600 ft and 150 ft AGL. Reliable difference were found as a function of display variables. GRA

N84-32236# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
DMA AND CIG: A SHOTGUN WEDDING **c82**
C. E. Wales and M. A. Cosman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 97-104 (For primary document see N84-32223 21-81)
(AD-P003459) Avail: NTIS HC A17/MF A01 CSCL 09/3

The DMA data base and its future enhancements have been hailed as the general solution to creating visual data bases for CIG. The imagery presented by the CIG system must tell the pilot where he is relative to his map, and where he is relative to the ground. These are two very different objectives, and emphasizing one may compromise the other. Heavy emphasis on capture criteria (for map fidelity) has historically resulted in systems which do an inadequate job of supporting low level flight, a task which depends on high scene density. This paper examines the capture criteria and scene densities required to support such missions, and quantifies critical aspects of a nap of Earth data base. We will examine various constraints inherent in CIG systems, and their influence on what can be achieved. We also will discuss data base definition strategies, including the use of DMA data, to see where traditional approaches have been deficient in providing the required visual cues. Then we will present an approach which combines DMA data, new mathematical methodologies and data base design strategies, and current production hardware, to meet both the capture criteria and scene density needs of nap of Earth missions. GRA

N84-32237# Hazeltine Corp., McLean, Va.
AN ADAPTIVE CBT (COMPUTER BASED TRAINING) COURSEWARE AUTHORING SYSTEM TO MEET THE NEEDS OF MILITARY AUTHORS **c61**
D. Mudrick and D. Stone *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 105-108 (For primary document see N84-32223 21-81)
(AD-P003460) Avail: NTIS HC A17/MF A01 CSCL 09/2

The use of computer-based training (CBT) is rapidly becoming more widespread within the military services. Courseware production, historically the most cost and labor intensive area of CBT, will become more difficult with the decline in availability of capable authoring personnel. Reasons for this decline and a potential solution-the development of advanced authoring systems--are discussed. A description of one such system, called ADAPT (for the TICCIT CBT system), is presented. GRA

N84-32238# Grumman Aerospace Corp., Bethpage, N.Y.
USER FRIENDLY AUTHORING LANGUAGES: AN ALTERNATIVE APPROACH **c61**
C. R. Myers, Jr. and R. A. Schaefer *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 109-114 (For primary document see N84-32223 21-81)
(AD-P003461) Avail: NTIS HC A17/MF A01 CSCL 09/2

Two general types of programming languages have been developed for computer based educational systems. The first type of language, which is patterned after such high order languages as PASCAL or FORTRAN, provides great programming flexibility. However, its structured, syntactical constructs require either that an experienced programmer be involved in lesson generation or that instructional personnel become skilled in sound programming techniques. To avoid these problems, the second type of language was developed. It allows instructional personnel to generate on-line instructional materials without acquiring sophisticated programming skills. This second category of languages is often thought of as being user friendly. They serve very well for many applications, but their use has not been without problems. This paper describes the OMEGA authoring system, a lesson authoring approach that provides instructional personnel with the positive features of both of the above language types. The paper first relates some basic facts about computer systems in general, and then discusses the various aspects of user friendliness in the context of educational programming. It then describes and evaluates both the traditional and OMEGA approaches to user friendly authoring. GRA

N84-32239# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.

EFFECTIVENESS OF MULTI-YEAR AND ADVANCE PROCUREMENT CONTRACTS

F. S. Belyea *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 115-117 (For primary document see N84-32223 21-81)

(AD-P003462) Avail: NTIS HC A17/MF A01 CSCL 05/1

Experience gained from the use of Multi-year and Advance Procurement contracts under the new regulations has proven that, within some restrictions, they have been beneficial to industry as well as cost effective for the Government. In a typical example, over 30% cost benefit over an annual procurement has been realized in acquisition and early delivery of training devices. The experience demonstrates the utility and adaptability of these regulations that can be attained through aggressive and innovative use. Additional changes and use of the regulations and uniform policies implementing the regulations would provide more frequent use of these procurement types. GRA

N84-32240# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

MANAGING AIRCRAFT/SIMULATOR CONCURRENCY

R. W. Beck and J. C. Clark *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 118-122 (For primary document see N84-32223 21-81)

(AD-P003463) Avail: NTIS HC A17/MF A01 CSCL 15/5

Concurrency is the word being used to describe the situation when a simulator or other aircrew training devices are required for delivery at the same time as the new aircraft it will support. If traditional acquisition approaches are applied to concurrent aircraft and simulation programs, it is practically impossible, in many cases, to deliver a fully capable aircrew training device anywhere near the Initial Operational Capability (IOC) of the aircraft. This is especially true when dealing with aircrew trainers for a complex tactical or strategic weapon system. Using the B-1B Simulator System program as an example, this paper discusses the risks and management challenges involved with concurrency and an innovative acquisition strategy designed to ensure the availability of aircrew training devices at or before the aircraft IOC. Included in this strategy are: (1) a new approach to preparation of the request for proposals documentation, (2) a competitive preliminary design effort, (3) methods for dealing with the acquisition of simulator design data, (4) the concept of providing the user a limited (interim) training capability early in the program, (5) management of a configuration baseline which evolves along with the simulator design, and (6) retrofit/update of all delivered devices to the final aircraft configuration. GRA

N84-32241# AAI Corp., Baltimore, Md.

MANAGING A LOW QUANTITY, HIGH TECHNOLOGY TRAINER DEVELOPMENT PROGRAM

L. J. Rytter *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 123-126 (For primary document see N84-32223 21-81)

(AD-P003464) Avail: NTIS HC A17/MF A01 CSCL 05/1

To effectively manage a low quantity, high technology trainer development program, the program management team must consider a variety of trade-offs during the development cycle. These trade-offs stem from the fact that a limited production trainer is neither a prototype nor a production line unit. This paper presents the issues and trade-offs which should be addressed by the program management team prior to and during the trainer development program. Author (GRA)

N84-32242# Falcon Research and Development Co., Buffalo, N.Y.

MARINE CORPS GROUND SIMULATOR TRAINING NEEDS IN THE 1985-1995 TIME FRAME **c53**

P. Patti and J. Marlin (Marine Corps., Quantico, Va.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 127-139 (For primary document see N84-32223 21-81)

(AD-P003465) Avail: NTIS HC A17/MF A01 CSCL 15/5

This study was initiated to develop a document to be used for the planning and programming of simulation acquisition in support of Marine Corps training. Generic training task requirements in the ground combat (C), combat support (CS) and combat service support (CSS) fields which can be enhanced through the use of simulation were identified. Tradeoff analyses were performed to develop prioritized lists of the tasks for which simulators should be developed and of recommended generic-type simulation devices. The extent of the need for simulation was assessed by determining which of the training task requirements would be improved by the use of simulation, taking into account the technology state-of-the-art (SOA). Measures of quality of training used included: performance, time to train, training cost, personnel support, technological risk, integratability with other training, and special assets requirements. This paper describes the methodology applied and the results obtained. Special emphasis is put on the criteria utilized and the planned future use of the results. Author (GRA)

N84-32243# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.

LOW-ALTITUDE DATABASE DEVELOPMENT EVALUATION AND RESEARCH (LADDER) **c82**

D. McCormick, T. Smith, F. Lewandowski, W. Preskar, and E. Martin (AFHRL, Williams AFB, Ariz.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 150-155 (For primary document see N84-32223 21-81)

(AD-P003468) Avail: NTIS HC A17/MF A01 CSCL 09/2

Singer-Link and the Air Force Human Resources Laboratory (AFHRL), Williams Air Force Base, combined efforts to investigate specific visual requirements during low-level, high-speed flight. Visual information requirements were hypothesized, and an experiment was designed to systematically test the effects of various visual cues upon flight performance. The experiment tested the effects of visual scene elements in supporting simulator flight tasks of experienced Air Force fighter pilots. Specific visual factors studied were: (1) the importance of surface texture, (2) the importance of 3-D objects and object type, and (3) the effect of turning and bank angle upon flight performance. Pilot subjects were able to control flight at a mean altitude of 198 feet and at an airspeed of 480 knots. Test results indicate that both 3-D objects and 2-D terrain surface texture aid controlled low-altitude flight. Author (GRA)

N84-32244# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

AN APPROACH TO A STANDARDIZED SIMULATOR DATA BASE **c82**

T. W. Hoog, J. D. Stengel, Jr., and M. R. Nicol *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 156-163 (For primary document see N84-32223 21-81)

(AD-P003469) Avail: NTIS HC A17/MF A01 CSCL 09/2

The current trend in user requirements for data bases to support visual, sensor, and radar simulation for training is toward real-world data bases that cover large geographic areas. The production of these data bases is an expensive process and typically each; new system develops new data base generation software, along with a data base itself, to meet its own specific needs. The objective of Project 2851 is to develop a DoD standard simulator data base and common transformation software to support all simulator training devices requiring the use of digital topographic data. The DoD standard simulator data base will provide a common source of digital data that will be specifically compiled to meet training objectives and which will minimize the need to enhance Defense Mapping Agency (DMA) data during the data base need to enhance Defense Mapping Agency (DMA) data during the data base generation/transformation process for each individual simulator

system. The goal of the common transformation program is to reduce the amount of system unique software for each simulator system. It will promote a greater degree of data base and software compatibility among the many DoD simulator systems. The results of the project should be improved simulator training capability at reduced development, acquisition, and life cycle costs to the Government. GRA

N84-32245# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
DATA BASE GENERATION: IMPROVING THE STATE-OF-THE-ART c82
P. A. Widder and C. W. Stephens *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 164-170 (For primary document see N84-32223 21-81)
(AD-P003470) Avail: NTIS HC A17/MF A01 CSCL 09/2

The development of data bases for computer image generation systems is a time consuming, labor intensive process. While the last ten years have seen tremendous advances in the capabilities and capacities of computer image generation, comparable advances have not occurred in the area of data base management. As visual systems can output more scene detail, they require data bases which contain more information and so, take longer to build. If some effort is not made to develop methods to build data base more efficiently, the limiting factor for the amount of detail contained in an environment will be the data base development time. This paper will discuss two projects currently underway at the Air Force Human Resource Laboratory (AFHRL), Williams Air Force Base, AZ, which enable data bases to be developed much quicker by allowing the modelers to utilize work which has been done in the past by AFHRL or other organizations. The first project is the development of software to convert data bases formatted for one visual system to the format required for another visual system. The second project is the development of a library of models. GRA

N84-32246# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.
SYNTHETIC APERTURE RADAR SIMULATION c32
N. Szabo *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 205-210 (For primary document see N84-32223 21-81)
(AD-P003474) Avail: NTIS HC A17/MF A01 CSCL 17/9

During the 1980's, a new generation of airborne radar systems will become operational. These radars will have a number of new capabilities, but their synthetic apertures will have the greatest impact on simulation of the system since they provide a tenfold increase in resolution. Increased radar landmass simulator resolution is not the only problem implied by this increase. In particular, the sparsity of the DMA data bases presents a challenge in the generation of realistic images. Other new requirements include the simulation of anomalies caused by the Doppler mapping. For the last two years, Link has conducted an R&D program to explore the requirements of these new generation radars. This paper reports on the results. Author (GRA)

N84-32247# Naval Training Equipment Center, Orlando, Fla.
REAL-TIME CGSI (COMPUTER GENERATED SYNTHESIZED IMAGERY)-SINGLE PIPELINE PROCESSOR c61
D. M. Baldwin, B. F. Goldiez (Dept. of the Army, Orlando, Fla.), C. P. Graf (Honeywell, Inc., Minneapolis, Minn.), and T. W. Dillingham (Honeywell, Inc., West Covina, Calif.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 243-252 (For primary document see N84-32223 21-81)
(AD-P003480) Avail: NTIS HC A17/MF A01 CSCL 09/2

Non-real-time feasibility was demonstrated in 1982 for a hybrid visual/sensor simulation approach which merges two technologies, Computer Generated Imagery (CGI) and Computer Synthesized Imagery (CSI) to form (Computer Generated Synthesized Imagery) (CGSI). This approach holds promise as a cost-effective, attainable method of providing real-time, high detail imagery for visual and/or other sensors, such as FLIR. Because of the high potential payoff from the development of this hybrid approach, a current program is aimed at demonstrating feasibility of this CGSI technology in real-time. CGSI uses a modular set of building blocks which may be configured to meet specific training and simulation requirements. The pipeline processor is the major element in a CGSI system. The pipelines accept control commands from the Field of View (FOV)/Controller module and input video data containing objects from the data base. The Pipeline Processor then outputs transformed objects to the scene-construction module and special-effects module. To control risks, a single pipeline is being fabricated and tested before the remaining modules and additional pipelines are fabricated. GRA

N84-32248# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
A LASER IMAGE GENERATION SYSTEM FOR HELICOPTER NAP-OF-THE-EARTH (NOE) FLIGHT TRAINING c38
H. M. Tong *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 253-261 (For primary document see N84-32223 21-81)
(AD-P003481) Avail: NTIS HC A17/MF A01 CSCL 05/9

The training effectiveness of the camera-modelboard visual system for low-altitude, nap-of-the-earth (NOE) flights, particularly for helicopters, is well established. Traditional camera-modelboard technology, however, has a number of inherent limitations which have been overcome by using a laser image generator instead of a TV camera as in the current generation of camera-modelboard systems. The first full-scale Laser Image Generation (LIG) visual system, developed by Singer-Link under the AH-IS Cobra Helicopter Flight Weapons Simulator contract, will be delivered to the U.S. Army in the near future. This new visual system offers improvements in many areas, some of which are discussed in this paper, together with the visual system technology involved and performance parameters achieved on the AH-IS simulator. Author (GRA)

N84-32249# Air Force Human Resources Lab., Williams AFB, Ariz.
FIBER OPTIC HELMET MOUNTED DISPLAY: A COST EFFECTIVE APPROACH TO FULL VISUAL FLIGHT SIMULATION c06
C. L. Hanson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 262-268 (For primary document see N84-32223 21-81)
(AD-P003482) Avail: NTIS HC A17/MF A01 CSCL 05/9

Wide field-of-view, high resolution, detailed visual displays are crucial for the effective simulation of complex air-to-air and air-to-ground combat environments. Current dome and dodecahedron systems are far to costly and lack the combination of required capabilities. The Air Force Human Resources Laboratory (AFHRL) is currently developing a fiber optic helmet mounted display (FOHMD) system which has the potential for filling these demanding requirements. The breadboard FOHMD, built through a Canadian cost-sharing contract with CAE Electronics, displays a head-slaved high resolution area of interest surrounded by a low resolution background in color. The instantaneous field-of-view is comparable to the view available to a pilot when wearing an Air Force helmet. Four image generation channels and projectors are used to generate individual displays for each eye. The imagery is piped to the helmet via coherent fiber optic bundles. This system is a valuable research tool for studying many of the issues associated with helmet mounted displays such as image stability, resolution/brightness/field-of-view trade-offs, and visual perception/fatigue. GRA

N84-32250# Singer Co., Lancing (England). Link-Miles Div.
DIGITAL CONTROL LOADING: A MICROPROCESSOR-BASED APPROACH c09
D. Parkinson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 269-273 (For primary document see N84-32223

21-81)
(AD-P003483) Avail: NTIS HC A17/MF A01 CSCL 05/9

This paper reports on a multi-year development effort to provide exact simulation of aircraft primary control systems under all conditions of aircraft control and operation for all regimes of flight and environment conditions. The development demonstrated the ability to develop realistic models and provide for their exact solution via digital computation while integrated with a highly responsive control force simulation system. Digital quantization effects are eliminated by very high rates of computation achieved by using dedicated microprocessors within the control loop, resulting in no degradation of control feel, smoothness, or response. Further improvements in long-term stability, calibration, and measurement are also achieved. The paper discloses the results of various comparative analyses between digital and analog, for various force and position servo loops, leading to the development of a microprocessor-based digital control loading system. Trace comparisons are made between the final breadboard system versus actual aircraft control measurements for force/displacement and dynamic stick response tests to demonstrate the fidelity achieved by the system. Author (GRA)

N84-32251# Naval Training Equipment Center, Orlando, Fla.
VHSIC (VERY HIGH SPEED INTEGRATED CIRCUITS) FOR TRAINING SYSTEMS **c33**
D. P. Glenn, H. T. Freedman (Honeywell, Inc., West Covina, Calif.), and J. A. Gardner (Honeywell, Inc., West Covina, Calif.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 274-286 (For primary document see N84-32223 21-81)
(AD-P003484) Avail: NTIS HC A17/MF A01 CSCL 09/5

Very High Speed Integrated Circuits (VHSIC) is a new technology which promises to have a major impact on the training and training device community. At this point in 1983 the performance predictions for the VHSIC technology are very close to being achieved. Not only will we have available to us significant increases in processing throughput, but the VHSIC chips will be smaller, lighter, require less power, and be more reliable than their predecessors. Cost savings are also predicted. As these advantages came close to reality in 1982, the Naval Training Equipment Center recognized a tremendous potential in the new chips to improve the future training devices and solve some problems being presented by the limitations of current technology. Therefore, a study contract was let to Honeywell (one of the six DoD VHSIC contractors) to investigate the impact of VHSIC on training and training devices. This paper will discuss the results of that study and indicate the future direction in which the VHSIC technology will drive the training community. GRA

N84-32252# Systems Productivity and Management Corp., Dayton, Ohio.
MICROPROCESSORS IN AIRCREW TRAINING DEVICES **c60**
R. J. Sylvester *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 287-294 (For primary document see N84-32223 21-81)
(AD-P003485) Avail: NTIS HC A17/MF A01 CSCL 09/2

Microprocessors are already embedded in Aircrew Training Devices (ATDs) for display generation, input/output control, and other special purpose applications. This paper deals with the key factors relating to the use of microprocessor systems (rather than minicomputers) in performing the central computational function for ATDs. Such factors include key performance parameters to be considered when replacing a 32-bit minicomputer by a system of microprocessors; requirements for a recent Air Force ATD system; benchmarks for computational performance; and specific changes to ATD prime item development specifications. Author (GRA)

N84-32253# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
DATA BASE MANAGEMENT OF SOFTWARE DEVELOPMENT **c82**
R. L. Schwing *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 295-299 (For primary document see N84-32223 21-81)
(AD-P003486) Avail: NTIS HC A17/MF A01 CSCL 09/2

The incessant increase in computational power provided by microelectronics has not begun to be matched by corresponding improvements in software productivity. This now trite observation has especially pernicious implications in the Weapon/Mission simulator field, where massive developments of demanding, new, real-time software in relatively short time spans are a way of life. This paper describes a new, comprehensive approach to satisfy this need: a software development environment which relates the total set of information relevant to the software product through data base management techniques. The main elements of the concept include: (1) Organization of the simulator (software and hardware) into a hierarchical framework, clearly separating functions so that top-down design and modularization will be substantially easier, (2) Arrangement of all types of product information - from specificatins, through requirements and designs, to code itself -- in an engineering data base patterned exactly upon the hierarchical framework in 1 above, (3) Merging of management status information and configuration control data into the same framework, (4) Provision of a coherent set of tools to connect all elements of the data base for development, control, and management purposes. GRA

N84-32254# Boeing Military Airplane Development, Wichita, Kans.
SOFTWARE DOCUMENTATION SUPPORT **c61**
K. M. Atchinson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 300-304 (For primary document see N84-32223 21-81)
(AD-P003487) Avail: NTIS HC A17/MF A01 CSCL 09/2

Generation and support of documentation accompanying software development is historically a low-efficiency, high-cost undertaking. Frequently the situation arises where a choice must be made to fulfill documentation requirements and incur cost and schedule overruns, or to complete the software product in a reasonable time and deliver less than adequate documentation. The primary difficulties are efficient generation, quick and thorough update, and document correlation on large projects. Automated methods can alleviate these problems by: (1) application of word processing systems to the generation and editing of descriptive text, (2) use of a data base manager-type control of system interface definition and document correlation, (3) use of pseudo-code for first-time design and flowchart generation, and (4) the use of special purpose software tools to perform analysis of code for flowchart and module interface updating. Author (GRA)

N84-32255# AAI Corp., Cockeysville, Md.
SOFTWARE PROGRESS TRACKING SYSTEM **c61**
T. M. Moriarity *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 305-311 (For primary document see N84-32223 21-81)
(AD-P003488) Avail: NTIS HC A17/MF A01 CSCL 09/2

A software progress tracking system which uses an earned point scheme has been successfully used to monitor software development on several large simulator programs. Points are assigned for each step in the software development cycle on a per element basis. The steps are hard milestones in which a generated product is accepted by program management. As the products are accepted the associated points are earned. The ratio of earned points to total possible points is compiled on an element, functional area, or total software system basis to determine progress achieved. A report generator program usually resident on the simulator computational system, tabulates the data in a variety of management reports. The system as implemented is flexible, highly automated, and is closely coupled to configuration management systems and software quality assurance procedures to ensure validity of data. The accumulated point values are quickly ascertained, objective, and based on the point values provide an

accurate measure of progress, deviation from schedule, and prediction of future progress. GRA

N84-32256# Essex Corp., Alexandria, Va.
USER-FRIENDLY SOFTWARE: THE ROLE OF THE USER c61
E. Callahan *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 312-319 (For primary document see N84-32223 21-81)
(AD-P003489) Avail: NTIS HC A17/MF A01 CSCL 09/2

This paper presents a definition of the term user-friendly as it relates to computer software-human interaction. The software generation process, the various types of computer software users, and the role users should play in the software generation process are described. The author strongly recommends direct involvement on the part of the user(s) of computer software systems.
Author (GRA)

N84-32257# Boeing Military Airplane Development, Wichita, Kans.
INCREASED READINESS THROUGH MODULARITY c09
F. W. Snyder *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 329-334 (For primary document see N84-32223 21-81)
(AD-P003491) Avail: NTIS HC A17/MF A01 CSCL 05/9

A current DoD thrust to develop and apply modularity approaches, tools and standards to training simulator development and acquisition is expected to yield benefits in reduced cost and acquisition time, as well as improved supportability. Top-down functional design of stand alone modules and well-defined interfaces will enhance simulator system designs. This paper examines the effects and benefits of modularity which are expected to increase readiness through earlier trainer availability dates and increased supportability. The derivative effect of modularity appears to provide new options that can operate to support increased defense readiness. Author (GRA)

N84-32258# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
A FOUR-DIMENSIONAL THUNDERSTORM MODEL FOR FLIGHT SIMULATORS c09
J. T. Klehr *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 335-338 (For primary document see N84-32223 21-81)
(AD-P003492) Avail: NTIS HC A17/MF A01 CSCL 05/9

The recent airliner crash at New Orleans indicates that windshears due to thunderstorm downbursts challenge the most experienced and well-trained pilots. Much controversy exists as to the correct flight procedures for takeoff and landing under downburst windshear conditions. Flight simulators provide a safe environment to test procedures and train pilots for hazardous flight situations, but in the past, flight simulators have been unable to realistically duplicate the complex changes that occur temporally and spatially in real-world thunderstorms. A thunderstorm model based upon real-world data has now been developed for flight simulators, which provides twelve meteorological flight parameters which change in three-dimensional space and over a thirty-minute time span with color weather radar representations of the storm coordinated in time and space. The storm data set (representing a 20nm x 20nm x 3200-ft volume) is based upon multiple Doppler radar analyses of a 1978 Illinois thunderstorm. This data has been supplemented by a well-documented, fine resolution, downdraft model to provide realistic values in the hazardous regions of the sudden downdraft and its resulting turbulent gust front. GRA

N84-32259# General Electric Co., Daytona Beach, Fla.
THE PROGRAM PLANNING REVIEW (PPR): MILESTONE OR MILLSTONE?
R. B. Walker and R. E. DeNezza (ASD) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 339-342 (For primary document see N84-32223 21-81)
(AD-P003493) Avail: NTIS HC A17/MF A01 CSCL 05/1

Current Air Force practices invoke the Program Planning Review (PPR) and its associated data submissions and review meetings on all new simulator procurements. The PPR, as defined by Air Force policy, provides both the contractor and Air Force program offices with insight into the program plans to insure successful completion of all contract objectives. This paper summarizes the successful completion of the PPR requirements on a current Air Force simulator contract where proper preparation and implementation of the program plans by the contractor, and prompt, explicit review by the government, resulted in a program baseline which has met all cost and schedule objectives to date. GRA

N84-32260# Veda, Inc., Dayton, Ohio,
SOME MANAGEMENT INITIATIVES TO IMPROVE EMBEDDED COMMERCIAL COMPUTER AND TRAINING DEVICE LIFE CYCLE SUPPORT
W. W. Gamble *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 343-349 (For primary document see N84-32223 21-81)
(AD-P003494) Avail: NTIS HC A17/MF A01 CSCL 05/1

This paper discusses some of the problems associated with the use of commercial off-the-shelf computer systems in aircrew training devices and offers some suggestions for improving the life cycle management of commercial computer systems in such military training devices. The impacts of commercial practices and computer capacity limitations are addressed as well as acquisition and logistics management considerations. Improved planning and management effectiveness will be needed in the 1980s to ensure that computer systems are supportable and/or replaced during the life cycle of training devices systems. Both acquisition and logistics support agencies will need to recognize that the life cycle of commercial computer systems may be limited by the lack of computer and peripheral vendor support and by the lack of expansion capability. Accordingly, training devices will need to be designed and developed to accommodate computer expansion or replacement. Computer system expansion or replacement will need to be anticipated to minimize training device to weapon system configuration differences caused by a lack of computer system supportability or capacity. This process could be termed Pre-Planned Product Preservation (P4). GRA

N84-32261# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
TRAINING THE MULTIPLE-AIRCRAFT COMBAT ENVIRONMENT c53
P. A. Cook and C. L. Hanson *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 350-355 (For primary document see N84-32223 21-81)
(AD-P003495) Avail: NTIS HC A17/MF A01 CSCL 05/9

Aircrew training devices for the teaching of tactical combat maneuvering currently range from simple desk-top trainers to large weapon system trainers with limited visual systems. Still missing from the spectrum is the capability to practice full-mission multi-ship scenarios. At present such training can only be provided by major field exercises such as Red Flag, at great expense. A network of hostile-environment simulators could greatly increase the frequency of training, provide more realistic training, and keep pilots at a higher state of readiness than by using aircraft alone. The Air Force Human Resources Laboratory is exploring technology requirements for multiple aircraft simulation under Project 2743, the Combat Mission Trainer (CMT) program. The goal is to develop a full-mission combat simulator affordable at the wing level and capable of training all air-to-air and air-to-ground tasks.
Author (GRA)

N84-32262# Burtek Corp., Tulsa, Okla.
LOGISTIC SUPPORT: A COMPUTER MANUFACTURER'S VIEWPOINT
G. T. McCaskill *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1

16 Nov. 1983 p 356-362 (For primary document see N84-32223 21-81)
(AD-P003496) Avail: NTIS HC A17/MF A01 CSCL 15/5

When the Department of Defense directed that commercially available standard off-the-shelf computer systems would be used for military simulation programs in place of special militarized computers the intent was clear: Cut costs! Now, more than a decade after that DoD directive, it is possible to look back, recognize the value of the decision, and identify many of the problem areas that have been created for the military simulation program organizations. The military services have attempted to address the problems posed by the apparent conflict of needs but have met with minimal success to date. This paper is a computer manufacturer's look at some of the support problems that have been created by the use of commercially available computer systems, some of the solutions that have been considered, and some actions that should be explored if resolutions to the problems are to be achieved. Author (GRA)

N84-32263# Boeing Military Airplane Development, Wichita, Kans. Military Training Systems Div.
PROFIT RESPONSIBILITIES IN THE SIMULATION AND TRAINING EQUIPMENT INDUSTRY
J. L. Mitchael *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 363-366 (For primary document see N84-32223 21-81)
(AD-P003497) Avail: NTIS HC A17/MF A01 CSCL 05/3

The objective of increased readiness through training can be enhanced through mutual military/industry efforts to support a viable earnings position. Strong financial health of companies competing in the market provides the resources, knowledge and systems that supply advanced technology and products that meet military training objectives. Government agencies can contribute by providing clear definitions of the product needed, by imposing only specifications necessary to meet acceptable quality, and by contracting provisions commensurate with program risk. With firm product goals and applicable specifications, industry can minimize risk through sound planning and stable performance. Industry can contribute by developing resources and systems that are efficient and effective in providing training products. Capability growth fosters innovativeness in advanced planning and productiveness, which are significant to providing quality products on schedule at the lowest cost possible. Industrial growth to bring this about is possible only if industry is in a strong financial position.
Author (GRA)

N84-32264# AAI Corp., Baltimore, Md.
AUTOMATED SOFTWARE TESTING **c61**
R. Spital *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 367-370 (For primary document see N84-32223 21-81)
(AD-P003498) Avail: NTIS HC A17/MF A01 CSCL 09/2

In order to obtain the enhanced testing capability required to test sophisticated trainer software and to ensure the quality of test documentation, AAI has developed an automated software testing system. Its advantages inlcude: (1) Automatic production of all test documentation, (2) Guaranteed agreement of the values inserted into or read from memory during a test with test documentation, (3) Guaranteed consistency of test documentation with other documents, (4) The ability to compare or insert repetitively large buffers of data; testing is no longer subject to the limitations of hand-insertion of data, or visual comparison of data, (5) Simultaneous updating of both test and test documentation through the editing of test disc files, (6) The ability to save large areas of memory for future comparisons, a feature especially useful for software integration. This paper examines the AA! software package in detail. Author (GRA)

N84-32265# AAI Corp., Baltimore, Md.
AUTOMATIC AUDIT INFORMATION SYSTEM FOR SOFTWARE DEVELOPMENT **c82**
G. A. Brown *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 371-382 (For primary document see N84-32223 21-81)
(AD-P003499) Avail: NTIS HC A17/MF A01 CSCL 09/2

Management of a software development project is typically characterized by a lack of control and poor projections. Status reports are notoriously inaccurate; worse yet, the prerequisite software audits drain development resources from the design effort. This paper describes an automated procedure for performing software audits and generating status reports. This procedure reduces the time required for both tasks significantly, and makes status reports available upon demand. Timely status reports furnish management with an early warning of problem areas so that project control can be exercised. For example, resources may be reallocated or additional resources employed where these problems are identified. The Automatic Audit Information System for Software Development (AAIS) procedure has been implemented by AAI Corporation for the development of Device 20B5. It is based upon the following concepts: A central software development library, Software development milestones and criteria, Functional hierarchies, and A development scoreboard. AAIS provides the 20B5 management with close project control by means of timely audits and concise status reporting. GRA

N84-32266# American Defense Preparedness Association, Arlington, Va.
PROCEEDINGS OF THE 5TH INTERSERVICE-INDUSTRY TRAINING EQUIPMENT CONFERENCE, VOLUME 2
16 Nov. 1983 269 p Proc. held in Washington, D.C., 14-16 Nov. 1983
(AD-A142775) Avail: NTIS HC A12/MF A01 CSCL 05/9

The theme of this conference is increased readiness through training. Certainly, meeting this challenge becomes more difficult year by year as our weapon systems become more capable and also more complex. Multi-million dollar weapon systems demand the ultimate in training to ensure that crews are ready to operate them at their maximum effectiveness. Otherwise, we may have wasted valuable dollars buying increased capability that, for the lack of training, we cannot use effectively. This, then, is our readiness through training challenge. The purpose of these conferences is to promote the interchange of information between government and industry. It is only when industry thoroughly understands the government need and government thoroughly understands industry's capability that we can work together and function effectively as a team. GRA

N84-32267# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
SOLUTION AND SENSITIVITY ANALYSIS OF RESDYN MODEL 1A USING SENSUMT
A. V. Fiacco and F. A. Amodeo 30 Mar. 1984 26 p
(Contract N00014-83-K-0215; NR Proj. 047624)
(AD-A142788; GWU/IMSE/SERIAL-T-485/84) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper describes a solution to a resource allocation problem (Model 1a) using SENSUMT, without using the piecewise linear approximation to the objective function which was employed in previous solutions. Sensitivity results are also presented. GRA

N84-32268# Wisconsin Univ., Madison. Mathematics Research Center.
EQUITABLE ASSIGNMENT RULES Technical Summary Report
P. Glynn and J. L. Sanders May 1984 38 p
(Contract DAAG29-80-C-0041)
(AD-A142809; AD-E401119; MRC-TSR-2685) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper investigates the formalization of an important class of management decision problems. The problems considered are those of making equitable workload assignments to personnel. The paper proposes a series of intuitively appealing assignemnt rules, including random assignment, fixed assignment, block

rotation and rules that reverse inequities caused by the last period's assignments. It is shown that in the two-person case none of these rules satisfies the simple criterion that cumulative differences of workload assignments among personnel become and remain small. Differences in the properties of these rules are investigated under three additional but less strenuous criteria. It is shown that a new assignment rule called the counter-current rule does satisfy the criterion stated above; further, it is shown that it is an optimal rule under a fairly weak set of requirements. The extension of the results from the two-person case to the n-person case is discussed briefly and some initial results are presented. GRA

N84-32269# Department of Energy, Washington, D. C. Office of Project and Facilities Management.
COST AND SCHEDULE CONTROL SYSTEMS CRITERIA FOR CONTRACT PERFORMANCE MEASUREMENT, INFORMATION PAMPHLET
May 1984 54 p
(DE84-012576; DOE/MA-0155) Avail: NTIS HC A04/MF A01

Interested DCE and industry personnel are informed about the basic concepts and general requirements of the Cost and Schedule Control Systems Criteria (CSCSC) of DOE Order 2250.1A. The CSCSC do not represent a management system nor are specific methods of organization or operation prescribed. The criteria are intended to serve as standards of measuring adequacy of management control systems. Objectives in using the criteria are: (1) to provide an accurate status of contract progress; (2) to provide early visibility to problems - prevent surprises; (3) to improve estimated final cost projections; (4) to improve on sortcomings of prior requirements; and (5) to minimize proliferation of systems and data problems. The CSCSC contain thirty-five criteria which are grouped into five categories: organization; planning and budgeting; accounting; analysis; and revisions and access to data.

N84-32270# National Science Foundation, Washington, D.C.
GUIDE TO PROGRAMS, FISCAL YEAR 1984: GUIDE DESCRIBING NATIONAL SCIENCE FOUNDATION PROGRAMS AND ACTIVITIES
Oct. 1983 86 p
(PB84-193226; NSF-83-67) Avail: NTIS HC A05/MF A01 CSCL 05A

This guide describes all of the Foundation's programs and activities. It is divided into chapters reflecting NSF's major divisions and details the areas of scientific and engineering research supported by each. Also included: a current NSF organization chart and the Nat'l Science Board's Criteria for the Selection of Research Projects. GRA

N84-32271# National Academy of Sciences - National Research Council, Washington, D. C. Board on Assessment of NBS Programs.
AN EVALUATING REPORT ON THE INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY, NATIONAL BUREAU OF STANDARDS, FISCAL YEAR 1983
Apr. 1984 13 p
(Contract NB82-SBCA-1505)
(PB84-194802) Avail: NTIS HC A02/MF A01 CSCL 05A

An evaluation of the technical functions and programs of the Institute for Computer Sciences and Technology, a major organizational unit of the National Bureau of Standards, is presented. Common problems are identified, possible solutions are suggested, and significant developments are highlighted. E.R.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-32272* National Aeronautics and Space Administration, Washington, D. C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY, A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 25)
Jul. 1984 49 p 2 Vol.
(NASA-SP-7039(25)-Sect-1; NAS 1.21:7039(25)-Sect-1) Avail: NTIS HC $10.00 CSCL 05B

Abstracts are provided for 102 patents and patent applications entered into the NASA scientific and technical information system during the period January 1984 through June 1984. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. E.R.

N84-32273 British Library Lending Div., Boston Spa (England).
SPECIAL FEATURES OF INFORMATION PRESENTATION IN TEACHING SYSTEMS
V. P. Avdeev, V. Ya. Dubovik, S. R. Zeltser, I. I. Strokova, and L. K. Chichkova 26 Apr. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 126-129
(BLL-M-35604-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A systems approach to the problem associated with the presentation of information in teaching systems regarded as a component of complete teaching simulation is outlined. The factors considered are the descriptiveness, completeness, standard nature, pace difference, multi-structure nature, activity and individuality of information presentation, all of which must be taken into account together with the production, design, and testing of automated-control systems when developing the approach. R.J.F.

N84-32274 Illinois Univ., Urbana-Champaign.
CONTENT DUPLICATION AMONG DOCUMENTS ON SPECIFIC SUBJECTS Ph.D. Thesis
Richard Irving Blue 1984 247 p
Avail: Univ. Microfilms Order No. DA8409749

An attempt was made to see how duplication of textual content among documents on the same specific medical subjects varied with time. Text analysis was performed on sets of documents that had been located with MEDLINE searches. Duplication of sentence segments between two documents was assumed to indicate duplication of content. More duplication of sentence segments was found for current documents than for older ones. Use of sentence segment duplication as a measure of document overlap was also compared to use of interdocument duplication of index terms (a method described earlier by Cleverdon and Kidd) as a measure of document overlap. A greater range of variability was found in the text overlap measure, which may indicate that textural content duplication is the more discerning of the two measures. Although the results were inconclusive in many ways, the study at least tested an alternative methodology for measuring content overlap and prepared the way for larger scale studies.
Dissert. Abstr.

N84-32275 Stanford Univ., Calif.
THE USER'S MENTAL MODEL OF AN INFORMATION RETRIEVAL SYSTEM: EFFECTS ON PERFORMANCE Ph.D. Thesis
Christine Louise Borgman 1984 377 p
Avail: Univ. Microfilms Order No. DA8408258

An empirical study was performed to train naive subjects in the use of a prototype Boolean logic-based information retrieval system on a database of bibliographic records drawn from the OCLC system. The research was based on the mental models theory from cognitive psychology which proposes that people can be trained to develop a mental model or a qualitative simulation of a system which will aid in generating methods for interacting with the system, debugging errors, and keeping track of one's place in the system. Conceptual training based on a system model will be superior to procedural training in the mechanics of the system. A laboratory experiment was performed with two training conditions (conceptual and procedural), with each condition split by gender. As predicted, the conceptual training had no effect on

the ability to perform simple, procedural tasks, but subjects trained conceptually performed better on complex tasks which require extrapolation from the basic operations of the system. The few gender differences that were found were trivial. Dissert. Abstr.

N84-32276 Illinois Univ., Urbana-Champaign.
THE RELATIONSHIP BETWEEN ADMINISTRATIVE STYLE AND THE USE OF COMPUTER-BASED SYSTEMS: AN ATTITUDINAL STUDY OF ACADEMIC LIBRARY PROFESSIONALS Ph.D. Thesis
John Newman Olsgaard 1984 230 p
Avail: Univ. Microfilms Order No. DA8409822

The relationships between the attitude of academic library professionals toward the level of participative management used by immediate supervisors in academic libraries in the United States, and the attitude of professional academic library employees toward computer-based systems is studied. The null hypothesis was that no statistically significant relationship exists between these variables. The alternative hypothesis was that a statistical relationship does exist. In order to explore the above hypotheses a mail survey was conducted of two populations. It was determined that a statistically significant nonlinear relationship does exist between the variables, that is, that the alternative hypothesis was supported. It was further determined that a model explaining the variation of the attitude of academic librarians toward computer-based systems could be constructed. This model was tested by instituting a logarithmic transformation of both the data reflecting the level of participative management, and of the data of a variable reflecting exposure to computer-based systems. By imposing additional refinements, over 80 percent of the variance of the dependent variable could be explained through the use of this proposed model. Dissert. Abstr.

N84-32277 Illinois Univ., Urbana.
PAGE INDEXING FOR TEXTUAL INFORMATION RETRIEVAL SYSTEMS Ph.D. Thesis
Perry Alan Emrath 1983 150 p
Avail: Univ. Microfilms Order No. DA8409916

A number of applications exist for systems which can store and interactively retrieve from very large natural language textual databases. Conventional approaches to the design of such systems are discussed. The notion of page indexing is introduced as a scheme for doing information retrieval from natural language full-text databases. The structure of a page indexed database is described and the algorithms needed to do retrieval using the page index are presented. Some characteristics of page indexed text are analyzed and measured in order to estimate the size of the page index, and to show how the size of the index is related to the page size. One of the advantages of the page indexing scheme is the ease with which such a system can be analyzed. This analysis is based on characteristics of the hardware used to implement the system and on characteristics of queries. Finally, three hypothetical systems are proposed and analyzed. These systems range from a microprocessor for a data base of 250 megabytes to a large computer system employing multiple special purpose processors for a database of 50 gigabytes. Dissert. Abstr.

N84-32278 California Univ., Los Angeles.
A DESIGN AUTOMATION DATABASE FOR COMPUTER AIDED DESIGN OF COMPUTER SYSTEMS Ph.D. Thesis
Joan Beverly Marshall 1983 318 p
Avail: Univ. Microfilms Order No. DA8408842

The primary aim is to investigate properties of a data base management system which has as its primary purpose, serving computer aided design and in particular, Computer Aided Design of Computer Systems (CADOCS). The SARA (Systems ARchiect Apprentice) design methodology and support system is used as a testbed. Particular attention is focused on the SARA Library System proposed by Drobman. Following analysis of experiences and studies of design data base management systems by a number of industrial organizations, a CODASYL model is constructed and an existing data base is integrated with the SARA System. The resulting experimental environment enabled quantitative and qualitative changes to be considered in an attempt to improve performance. As a concrete example the indirect interface of the CADSAT system is compared with the design specific interface of the SARA Library system. Dissert. Abstr.

N84-32279 Vanderbilt Univ., Nashville, Tenn.
A STATISTICAL CLASSIFICATION MODEL FOR A DATABASE SYSTEM Ph.D. Thesis
Iheanacho Ekenulo Nwokogba 1983 179 p
Avail: Univ. Microfilms Order No. DA8409668

Traditional databases accommodate statistical applications and other applications at an abstraction level higher than the user level. Many inefficiencies arise partly due to the nature of statistical analysis and partly due to the inappropriateness of traditional databases in modelling statistical analysis. The inefficiencies include high response times and redundant calculations. Statistical anaysis processes exploitable properties that can be used to integrate the realization of statistical functions with the dataase activity of data acquisition. When statistical functions are parameterized, it is easy to see that they share some common parameters and that these parameters are both updatable and additive. These properties are used to develop the concept of a classification system. The representative classification systems at all three database abstraction levels are developed and attendant algorithms together with their analyses are given. Theoretical numerical error analysis is also included since updatability introduces additional rounding errors. Dissert. Abstr.

N84-32280 Vanderbilt Univ., Nashville, Tenn.
A NON-FIRST-NORMAL-FORM RELATIONAL DATABASE MODEL Ph.D. Thesis
Stan J. Thomas 1983 108 p
Avail: Univ. Microfilms Order No. DA8409675

A current trend towards the integration of information retrieval functions into database management systems requires enhancement of the relational database model to incorporate data types other than flat records. Codd's relational model is extended by dropping the first-normal-form (1NF) assumption. The resulting non-1NF relations have many of the properties of 1NF relations and yet allow one to deal with structures such as hierarchies and repeating values within the context of the relational model. The model is specified in a formal system permitting the description of both 1NF and non-1NF database schemes. The operators NEST and UNNEST are studied which serve as transformations between 1NF and non-1NF relations and it is proved that some sequences of NEST, UNNEST operations applied to a 1NF relation are information lossless. Extensions of the usual relational operators to non-1NF relations and several desirable properties for these operators are also considered. A comparison is made between a 1NF and a non-1NF database design and several topics for further research are discussed. Dissert. Abstr.

N84-32281 Stanford Univ., Calif.
A PHYSICAL DATABASE DESIGN METHODOLOGY USING THE PROPERTY OF SEPARABILITY Ph.D. Thesis
Kyu-Young Whang 1984 342 p
Avail: Univ. Microfilms Order No. DA8408378

An approach to the multiple physical database design is presented. Most previous approaches towards multiple physical database design concentrated on developing cost evaluators. A theory called separability is developed to partition the entire database design problem into collective subproblems. Straightforward heuristics are subsequently employed to incorporate the features than cannot be included in the theory. The theory of separability can be applied to network model databases as well. In particular, show that a large subset of practically important access structures that are available in network model database systems satisfies the conditions for separability. Three physical database design algorithms for relational database systems are proposed. These algorithms were implemented in the Physical Database Design Optimizer (PhyDDO) in about 6000 lines of PASCAL code and tested for their validation. The solutions

generated by the design algorithms do not significantly deviate from the optimal solutions. Dissert. Abstr.

N84-32282*# Towson State Univ., Md. Dept. of Computer and Information Sciences.
LOGICAL OPTIMIZATION FOR DATABASE UNIFORMIZATION Technical Report, 1 Sep. 1983 - 31 Aug. 1984
John Grant 1984 98 p refs
(Grant NAG5-267)
(NASA-CR-173836; NAS 1.26:173836) Avail: NTIS HC A05/MF A01 CSCL 05B

Data base uniformization refers to the building of a common user interface facility to support uniform access to any or all of a collection of distributed heterogeneous data bases. Such a system should enable a user, situated anywhere along a set of distributed data bases, to access all of the information in the data bases without having to learn the various data manipulation languages. Furthermore, such a system should leave intact the component data bases, and in particular, their already existing software. A survey of various aspects of the data bases uniformization problem and a proposed solution are presented. Author

N84-32283*# National Aeronautics and Space Administration, Washington, D. C.
MICROGRAVITY SCIENCE APPLICATIONS BIBLIOGRAPHY: 1984 REVISION
Elizabeth Pentecost (Universities Space Research Association, Washington, D.C.) Sep. 1984 71 p
(NASA-TM-86651; NAS 1.15:86651) Avail: NTIS HC A04/MF A01 CSCL 05B

A compilation of Government reports, contractor reports, conference proceedings, and journal articles dealing is presented that deal with flight experiments utilizing a low gravity environment to elucidate and control various processes or with ground based activities that provide supporting research. Subdivisions include six major categories: (1) Electronic Materials; (2) Metals, Alloys, and Composites; (3) Fluid Dynamics and Transports; (4) Biotechnology; (5) Glasses and Ceramics; and (6) Combustion. Also included are publications from the European, Soviet, and Japanese MSA programs. In addition, there is a list of patents and appendices providing a compilation of anonymously authored reports and a cross reference index. M.A.C.

N84-32284# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
NEW TECHNICAL INFORMATION MEDIA
Ingrid Neumann-Duscha 1983 18 p refs Transl. into ENGLISH from Monatsschrift fuer Brauwissenschaft (Berlin), no. 1, 1983 p 6-12
(CSIR-Trans-1731) Avail: NTIS HC A02/MF A01

The development and use in the last few years of readily accessible online data banks are discussed, as well as already foreseeable further developments such as decentralized data processing by microcomputers; video readers and printers; and improved communications networks. These developments are now being applied to technical information in the brewing industry and contributing to the more efficient use of such information. R.J.F.

N84-32285# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 38, NO. 5 Monthly Publication
L. E. Shaffer May 1984 268 p
(AD-A141713; ESN-38-5) Avail: NTIS HC A12/MF A01 CSCL 05/2

Numerous articles on behavioral sciences, biological sciences, computer sciences, education, energy, material sciences, oceanography, physics, and science policy are presented. Cognitive psychology, sea canals, shallow water environments and a new type of natural radioactivity are among the topics discussed. GRA

N84-32286# National Classification Management Society, Inc.
CLASSIFICATION MANAGEMENT. JOURNAL OF THE NATIONAL CLASSIFICATION MANAGEMENT SOCIETY, VOLUME 19, 1983
E. Suto, ed. and D. Goldsby, ed. 1984 189 p
(AD-A143015; ISSN-0009-8434) Avail: NTIS HC A09/MF A01 CSCL 05/2

Contents: Keynotes Defense Investigative Service Overview; Defense Investigative Service-Current Areas of Interest (DIS Panel Presentation); Information Security Oversight Office; Disco Clearance Procedures; DIS Workshop-Marking Requirements; DIS Workshop-DD 254'S; OPSEC Where are We (Panel); ADP Security; GAO Security Review Update; NCMS International Affairs Committee; Operation Exodous; and Government Industry Panel on International Trade. GRA

N84-32287# California Univ., Berkeley.
RESOURCE CONTENTION, SYNCHRONIZATION, AND INFORMATION STRUCTURE IN DISTRIBUTED SYSTEMS Final Report, 1 Jul. 1980 - 31 Jul. 1984
P. Varaiya and E. Wong Jun. 1984 6 p
(Contract N00014-80-C-0507)
(AD-A143037) Avail: NTIS HC A02/MF A01 CSCL 09/2

This research focused on two generic problems. The first deals with the situation where there is a finite number of discrete resources which must be allocated among a number of competing processes (users). The second problem concerns the (centralized) control of a stochastic system where information is collected by several local sensors. The local sensors constitute a distributed data base. The control must be based on information obtained from this data base under the constraint of limited communication capacity. Author (GRA)

N84-32288# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SELECTED BIBLIOGRAPHY OF SOLAR THERMAL LITERATURE. VOLUME 2: INDEXES
1984 415 p
(Contract DE-AC02-77CH-00178)
(DE84-009363; DOE/CH-00178/T20-Vol-2) Avail: NTIS HC A18/MF A01

A bibliography solar thermal literature is presented. The information provided by this publication is divided into two volumes. Volume 2 is composed of four sections in the following order: (1) subject index; (2) key words from titles index; (3) author index; and (4) report number index. DOE

N84-32289# Technical Information Center, Oak Ridge, Tenn.
ENERGY DATA BASE. SERIAL TITLES WITH ISSN LISTING
P. L. Hendricks, ed. Mar. 1984 1213 p refs Revised
(DE84-003876; DOE/TIC-4579-Pts-1/2-Rev-13) Avail: NTIS HC A99/MF A01

The DOE/TIC-4579 was revised to include the international standard serial number (ISSN) for journals. The TIC journal authority brings about conformity in citing the approximately 16,000 titles contained in this authority. It is a valuable tool in establishing the precise journal by ISSN and CODEN indication, especially for journals with the same title published in different locations. Serial Titles with ISSN Listing is comprised of two parts. Part one is an alphabetical listing by full title of the publication and includes abbreviated title, CODEN, ISSN, coverage code, and country code; part two is an ISSN title correlation arranged in numeric order by ISSN and also includes the CODEN and full title. DOE

N84-32290# Technical Information Center, Oak Ridge, Tenn.
ENERGY DATA BASE CORPORATE AUTHOR ENTRIES
P. L. Hendricks, ed. Apr. 1984 860 p refs
(DE84-003877; DOE/TIC-4585/R4) Avail: NTIS HC A99/MF A01

One of the ways to locate the results of research is to find reports in the Energy Data Base (EDB). The US Department of Energy is of of three agencies funding the major portion of government-supported research. This information field is established as an index point retrieveable in on-line searching and is included as an index in printed publications. To provide consistent

citing of names in bibliographic entries, this authority is created and maintained as a means of entry of corporate names into the EDB. To locate such information, either the seven digit code number assigned to the corporate entity of interest is used or use one word at a time from the corporate name. DOE

N84-32291# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DATA BASE MANAGEMENT SYSTEM OF THE NATIONAL LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAM
Lynette D. Carpenter, Chuck A. Aquilina, and Betsy A. Jordon Jun. 1984 15 p
(Contract DE-AC07-76ID-01570)
(DE84-012789; EGG-WM-6627) Avail: NTIS HC A02/MF A01

The National low level radioactive waste management program's data base management system is described. This system provides standardized data specification and reporting formats. Data on reactor and nonreactor waste, current and projected disposal volumes, and governing laws and regulations can be requested at national, regional, and state levels, yielding information that is of immediate benefit for decision making. The various integrated data bases and models currently available for various uses are described. DOE

N84-32292# Oak Ridge National Lab., Tenn.
REVIEW OF EXISTING ENVIRONMENTAL AND NATURAL RESOURCE DATA BASES
R. J. Olson May 1984 75 p refs
(Contract DE-AC05-84OR-21400)
(DE84-012039; ORNL/TM-8928) Avail: NTIS HC A04/MF A01

Environmental and natural resource (E and NR) data are reviewed in terms of existing data bases, funding status of data bases, and long-term data base maintenance. Computerized E and NR data files and inventories of data files are described. The review is based on mail surveys, telephone contacts, and the 1983 Integrated Data Users Workshop, Data Resources in a Time of Fiscal Constraints. Twenty-four federal agency clearinghouse, referral, or data centers are identified that maintain inventories of E and NR machine-readable data files. Over 130 national, computerized E and NR data bases are identified by title, geographic scale, time period, agency, and contact person. Five large integrated data base systems containing E and NR data are described. The systems included DATAGRAF, GEMS, GEOECOLOGY, SEEDIS, and UPGRADE. Two systems, GEOECOLOGY and UPGRADE, are currently inactive due to funding cuts. The long-term maintenance of E and NR data includes updating files, documenting data and procedures, data base management, quality control, enhancing software/hardware capabilities, and other tasks to ensure that data will be available for analysis needs. DOE

N84-32293# Sandia Labs., Albuquerque, N. Mex.
TECHNOLOGY TRANSFER REVISITED
R. K. Traeger May 1984 11 p refs Presented at Meridian Technol. Transfer Conf., Washington, D.C., 30 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-012233; SAND-84-1063C; CONF-8405184-1) Avail: NTIS HC A02/MF A01

Recent concerns about the effectiveness of technology transfer have developed a misconception on both the need for and effectiveness of transfer processes. Research may be successful in solving a national problem but have no industrial application. The majority of the technology transferred is through many people, takes many routes, and usually requires 5 to 10 years to become incorporated; that transfer is invisible. Technology transfer is alive and effective, and should continue to be encouraged. However, transfer has to be done at the individual researcher level. Funds spent on tech transfer offices and studies could be more effectively spent on the research itself. DOE

N84-32294# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PRACTICAL WRITING AND EDITING TECHNIQUES
Edward J. Hallinan 1984 5 p Presented at the 31st Intern. Tech. Commun. Conf., Seattle, Wash., 29 Apr. 1984
(Contract DE-AC07-76ID-01570)
(DE84-012642; EGG-M-01284; CONF-840497-12) Avail: NTIS HC A02/MF A01

Technical writing and editing involve more than a knowledge of style and format. Often a draft must be prepared from existing documents and edited for content as well as style. A practical approach to writing and editing tasks includes increasing writer/editor exposure with cognizant personnel, researching source and legal documents, participating in project meetings, and reviewing the document by checking for inconsistences and selectively questioning the contents. This approach will help the writer/editor prepare a reasonably accurate, policitally acceptable document with a minimum of supervision. DOE

N84-32295# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TERMINAL OVERSIGHT: THE EDITOR AND THE WORD PROCESSOR
Reeta Garber 1984 7 p refs Presented at the 31st Intern. Tech. Commun. Conf., Seattle, 29 Apr. 1984
(Contract DE-AC07-76ID-01570)
(DE84-012658; EGG-M-01784; CONF-840497-11) Avail: NTIS HC A02/MF A01

The many editorial and administrative functions unique to a technical editor are evaluated relative to word processors. Editing functions are categorized into five major units, each linked to an administrative task. DOE

N84-32296# Oak Ridge National Lab., Tenn. Energy Div.
AN EVALUATION OF THE SYSTEM 2000 DATA BASE MANAGEMENT SYSTEM FOR USE IN MAJOR ITEM SYSTEM MAPPING
L. D. Duncan, B. S. Taylor (Lockheed Oak Ridge Engineering Co.), and J. P. Tomlinson (Lockheed Oak Ridge Engineering Co.) Jun. 1984 69 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013130; ORNL/TM-9232) Avail: NTIS HC A04/MF A01

The study compares the short and long term requirements of the Major Item System Mapping (MISM) computer software system with the capabilities of the System 2000 data base management system. The MISM system is intended to provide a system oriented approach for budgeting and managing major items of equipment. Both the hardware resource requirements and software features of System 2000 were evaluated. DOE

N84-32297# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
TEXT PROCESSING IN THE WRITING OF CONTRACTS [TRAITEMENT DE TEXTE AU SERVICE DE LA REDACTION DES CONTRATS]
Jacques Bernard and Jean-Claude Muller 1984 27 p In FRENCH Presented at Conf., Paris, 9 Mar. 1983
(SNIAS-841-422-102) Avail: NTIS HC A03/MF A01

Compilation problems encountered while drawing up contracts are discussed. Cut and paste methods were reviewed and tasks where EDP can be timesaving are identified. A text processing system is proposed. The system was implemented for a trial period of 15 months. Results are positive operationally, financially, and from a human factors point of view. Author (ESA)

N84-32298# Executive Office of the President, Washington, D.C. Office of Administration.
PUBLICATIONS OF THE EXECUTIVE OFFICE OF THE PRESIDENT, JANUARY 20, 1981 - MARCH 31, 1984
1984 6 p
(PB84-182328) Avail: NTIS HC A02/MF A01 CSCL 05B

The bibliography lists approximately 150 documents issued by the components of the Executive Office of the President, and available for sale to the public. Reports on the environment, Federal budget, and technology assessments are included. GRA

N84-32299# National Oceanographic Data Center, Washington, D. C.
KEY TO OCEANOGRAPHIC RECORDS DOCUMENTATION
Mar. 1984 246 p
(PB84-186360; KORD-14; NOAA-84041305) Avail: NTIS HC A11/MF A01 CSCL 05B

The National Oceanographic Data Center (NODC) is the United States national facility established to acquire, process, store, and disseminate global oceanographic data. A complete range of environmental data and information is available. NODC's master data files and other data holdings include data collected by U.S. Federal agencies, including the Department of Defense (primarily the U.S. Navy); State and local government agencies; universities and research institutions; and private industry. NODC does not conduct any data collection programs of its own; it serves solely as a respository and dissemination facility for data collected by others. A large portion of the data held by NODC is of foreign origin. GRA

N84-32300# National Library of Medicine, Bethesda, MD. Bibliographic Services Div.
NLM (NATIONAL LIBRARY OF MEDICINE) ONLINE SERVICES REFERENCE MANUAL: SUPPLEMENT
Apr. 1984 207 p
(PB84-186808; NLM-MED-84-02) Avail: NTIS HC A10/MF A01 CSCL 05B

Supplements the comprehensive search manual for NLM's online bibliographic retrieval system (MEDLARS) with three new chapters (Part 25 PDQ, part 26 Dirline, and Part 27 PDQ/Directory) and four completely revised chapters (Part 11 Serline, Part 16 Cancerlit and Cancerexpress, Part 18 Clinprot, and Part 23 Health planning and administration). GRA

N84-32301# Tracor Jitco, Inc., Rockville, Md.
OTS (OFFICE OF TOXIC SUBSTANCES) INFORMATION ARCHITECTURE NOTEBOOK Final Report
Henry Lau, Loren Hall, Geri Nowak, and Doug Sellers Aug. 1983 188 p
(Contract EPA-68-01-6651)
(PB84-188655; EPA-560/7-84-001) Avail: NTIS HC A09/MF A01 CSCL 06T

The methodology of scientific/technical information assessment by the EPA's Office of Toxic Substances (OTS) is presented. OTS information requirements are expressed in terms of data categories and subcatetories which are propertly defined and classified. These data categories are matched against a total of 700 computerized data bases and manual information resources in a series of matrices indicating where information may be available. Also included in this information assessment are the computer models for predicting physical/chemical properties or for assessing chemical fate and envionmental and human exposure. The adequacy of existing information resources are identified. GRA

N84-32302# General Accounting Office, Washington, D. C. Resources Community and Economic Development Div.
DEPARTMENT OF ENERGY'S ACTIVITIES TO LIMIT DISTRIBUTION OF CERTAIN UNCLASSIFIED SCIENTIFIC AND TECHNICAL INFORMATION
30 Mar. 1984 28 p
(PB84-189158; B0212184; GAO/RCED-84-129) Avail: NTIS HC A03/MF A01 CSCL 05B

The Department of Energy is a major publisher of unclassified scientific and technical information. The Technical Information Center, the Department's repository, sends most of its unclassified information to the National Technical Information Service, which sells it to the public. However, some of the information is limited to distribution within the federal government because it involves nuclear safety matters; securing foreign research results; or protecting patentable, propietary, and other information. This report describes the Department's procedures and controls for determining, distributing, and accessing unclassified information that is not made available to the public. GRA

N84-32303# National Technical Information Service, Springfield, Va.
DIRECTORY OF COMPUTERIZED DATA FILES, 1984
1984 333 p
(PB84-160126) Avail: NTIS HC A15/MF A01 CSCL 05B

The purpose of this directory is to provide current information on the availability and content of Federal machine-readable data files which are available from NTIS. Almost 1,000 data files are listed and described in the Directory; technical reports are not described. The minimum documentation (i.e., technical report) available for these data files is a description of the contents of the tape file (i.e., the record layout). The subject areas include economics, employment, social sciences, and science and technology. GRA

N84-32304# Environmental Protection Agency, Washington, D.C. Information Management and Services Div.
EPA (ENVIRONMENTAL PROTECTION AGENCY) JOURNAL HOLDINGS REPORT, 1983 Annual Report
Mar. 1984 230 p
(PB84-194877; EPA-IMSD-84-1; AR-8) Avail: NTIS HC A11/MF A01 CSCL 05B

The eight annual Journal Holdings Report of the library system of the United States Environmental Protection Agency Library Systems Staff contains approximately 5,000 unique titles and 9,000 holdings records. The report is arranged alphabetically by title. GRA

N84-31147# Naval Avionics Center, Indianapolis, Ind.
DATA WORD STANDARDIZATION
F. E. Peter *In* ASD Proc. Papers of the 2nd AFSC Avionics Standardization Conf., Vol. 1 Nov. 1982 p 327-336 (For primary document see N84-31121 21-06)
(AD-P003543) Avail: NTIS HC A25/MF A01 CSCL 09/4

N84-31198# Rome Air Development Center, Griffiss AFB, N.Y.
APSE DATABASE USER SCENARIO
E. S. Kean *In* ASD Proc. Papers of the 2nd AFSC Avionics Std. Conf., Vol. 2 Nov. 1982 p 1085-1096 Proc. held in Dayton, Ohio, 30 Nov. - 2 Dec. 1982 (For primary document see N84-31165 21-06)
(AD-P003593) Avail: NTIS HC A25/MF A01 CSCL 05/1

N84-32236# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
DMA AND CIG: A SHOTGUN WEDDING
C. E. Wales and M. A. Cosman *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 97-104 (For primary document see N84-32223 21-81)
(AD-P003459) Avail: NTIS HC A17/MF A01 CSCL 09/3

N84-32243# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.
LOW-ALTITUDE DATABASE DEVELOPMENT EVALUATION AND RESEARCH (LADDER)
D. McCormick, T. Smith, F. Lewandowski, W. Preskar, and E. Martin (AFHRL, Williams AFB, Ariz.) *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 150-155 (For primary document see N84-32223 21-81)
(AD-P003468) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32244# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AN APPROACH TO A STANDARDIZED SIMULATOR DATA BASE
T. W. Hoog, J. D. Stengel, Jr., and M. R. Nicol *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 156-163 (For primary document see N84-32223 21-81)
(AD-P003469) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32245# Air Force Human Resources Lab., Williams AFB, Ariz. Operations Training Div.
DATA BASE GENERATION: IMPROVING THE STATE-OF-THE-ART
P. A. Widder and C. W. Stephens *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 164-170 (For primary document see N84-32223 21-81)
(AD-P003470) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32253# Singer Co., Binghamton, N.Y. Link Flight Simulation Div.
DATA BASE MANAGEMENT OF SOFTWARE DEVELOPMENT
R. L. Schwing *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 295-299 (For primary document see N84-32223 21-81)
(AD-P003486) Avail: NTIS HC A17/MF A01 CSCL 09/2

N84-32265# AAI Corp., Baltimore, Md.
AUTOMATIC AUDIT INFORMATION SYSTEM FOR SOFTWARE DEVELOPMENT
G. A. Brown *In* American Defense Preparedness Association Proc. of the 5th Interservice/Ind. Training Equipment Conf., Vol. 1 16 Nov. 1983 p 371-382 (For primary document see N84-32223 21-81)
(AD-P003499) Avail: NTIS HC A17/MF A01 CSCL 09/2

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-32305*# Mechanical Technology, Inc., Latham, N. Y. Engine Systems Div.
AUTOMOTIVE STIRLING ENGINE DEVELOPMENT PROGRAM Semiannual Technical Progress Report, 1 Jul. - 31 Dec. 1983
N. Nightingale, W. Ernst, A. Richey, M. Simetkosky, G. Smith, C. Rohdenburg, A. Vatsky, and M. Antonelli, ed. Mar. 1983 85 p
(Contracts DEN3-32; DE-AI01-77CS-51040)
(NASA-CR-174622; DOE/NASA/0032-80/7; NAS 1.26:174622; Rept-84ASE369SA5) Avail: NTIS HC A05/MF A01 CSCL 13F

Activities performed on Mod I engine testing and test results, testing of the Mod I engine in the United States, Mod I engine characterization and analyses, Mod I Transient Test Bed fuel economy, upgraded Mod I performance and testing, Stirling engine reference engine manufacturing and reduced size studied, components and subsystems, and the study and test of low cost casting alloys are summarized. The overall program philosophy is outlined, and data and results are presented. Author

N84-32306*# Thermo Electron Corp., Waltham, Mass.
AN RC-1 ORGANIC RANKINE BOTTOMING CYCLE FOR AN ADIABATIC DIESEL ENGINE
L. R. DiNanno, F. A. DiBella, and M. D. Koplow Dec. 1983 125 p refs
(Contracts DEN3-302; DE-AI01-80CS-50194)
(NASA-CR-168256; DOE/NASA/0302-1; NAS 1.26:168256; TE4322-251-83) Avail: NTIS HC A06/MF A01 CSCL 10B

A system analysis and preliminary design were conducted for an organic Rankine-cycle system to bottom the high-temperature waste heat of an adiabatic diesel engine. The bottoming cycle is a compact package that includes a cylindrical air cooled condenser regenerator module and other unique features. The bottoming cycle output is 56 horsepower at design point conditions when compounding the reference 317 horsepower turbocharged diesel engine with a resulting brake specific fuel consumption of 0.268 lb/hp-hr for the compound engine. The bottoming cycle when applied to a turbocompound diesel delivers a compound engine brake specific fuel consumption of 0.258 lb/hp-hr. This system for heavy duty transport applications uses the organic working fluid RC-1, which is a mixture of 60 mole percent pentafluorobenzene and 40 mole percent hexafluorobenzene. The thermal stability of the RC-1 organic fluid was tested in a dynamic fluid test loop that simulates the operation of Rankine-cycle. More than 1600 hours of operation were completed with results showing that the RC-1 is thermally stable up to 900 F. A.R.H.

N84-32307*# United Technologies Research Center, East Hartford, Conn.
WASTE HEAT RECOVERY FROM ADIABATIC DIESEL ENGINES BY EXHAUST-DRIVEN BRAYTON CYCLES
H. E. Khalifa Dec. 1983 109 p refs
(Contract DEN3-304)
(NASA-CR-168257; DOE/NASA/0304-1; NAS 1.26:168257) Avail: NTIS HC A06/MF A01 CSCL 10B

An evaluation of Bryton Bottoming Systems (BBS) as waste heat recovery devices for future adiabatic diesel engines in heavy duty trucks is presented. Parametric studies were performed to evaluate the influence of external and internal design parameters on BBS performance. Conceptual design and trade-off studies were undertaken to estimate the optimum configuration, size, and cost of major hardware components. The potential annual fuel savings of long-haul trucks equipped with BBS were estimated. The addition of a BBS to a turbocharged, nonaftercooled adiabatic engine would improve fuel economy by as much as 12%. In comparison with an aftercooled, turbocompound engine, the BBS-equipped turbocharged engine would offer a 4.4% fuel economy advantage. If installed in tandem with an aftercooled turbocompound engine, the BBS could effect a 7.2% fuel economy improvement. The cost of a mass-produced 38 Bhp BBS is estimated at about $6460 or 170/Bhp. Technical and economic barriers that hinder the commercial introduction of bottoming systems were identified. Related studies in the area of waste heat recovery from adiabatic diesel engines and NASA-CR-168255 (Steam Rankine) and CR-168256 (Organic Rankine). Author

N84-32308# Department of Energy, Washington, D. C. Electric and Hybrid Vehicle Program.
OPERATION OF ELECTRIC VEHICLES IN THE US DEPARTMENT OF ENERGY TEST PROGRAM
Kenneth Friedman and Sarah J. LaBelle 1984 7 p refs Presented at the 7th Intern. Symp. on the Electric Road Vehicle, Versailles, France, 26 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-011703; CONF-840608-1) Avail: NTIS HC A02/MF A01

Over 700 electric vehicles have been in operation at more than 70 US sites since 1981. Data are collected on their operation. Analyses of these data indicate that the energy use of electric vehicles varies with temperature, age of battery, driver behavior,

terrain, vehicle operating speed and charging method, as well as with vehicle characteristics such as weight. Appropriate missions for electric vehicles have been identified, and many improvements to vehicle and component design suggested as a result of this program. Highlights of component tests now underway are described, as well as field tests of batteries. DOE

N84-32309# City of Portland, Oreg. Dept. of Parks and Public Works.
THE ELECTRIC VEHICLE PROJECT Final Progress Report
Maynard E. Sprague 18 Apr. 1984 3 p
(Contract DE-FC08-80NV-10113)
(DE84-011788; DOE/NV-10113/1) Avail: NTIS HC A02/MF A01

Operating experience on the electric vehicle project, costs, and problems encountered are reviewed. DOE

N84-32310# Office of Technology Assessment, Washington, D.C.
TECHNOLOGY, INNOVATION AND REGIONAL ECONOMIC DEVELOPMENT. BACKGROUND PAPER 2: ENCOURAGING HIGH-TECHNOLOGY DEVELOPMENT
Feb. 1984 99 p
(PB84-180181; OTA-BP-STI-25) Avail: NTIS HC A05/MF A01 CSCL 05C

The background paper examines a wide variety of initiatives launched by different communities and identifies some of the factors that lead to success: The intense competition for high-tech development has generated hundreds of high-technology initiatives. Those investigated here fall into six general categories: research, development, and technology transfer, human capital; entrepreneurship training and assistance; financial capital; physical capital; and information gathering and dissemination. State and local initiatives hold promise for promoting technological innovation and regional economic development. OTA's investigation suggests that additional factors increase the odds of success: identifying and focusing on local needs and resources; adapting to external constraints; linkage with broader development efforts; local initiative and partnership; and sustained effort. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-32311 Colorado Univ., Boulder.
LINE STUDIES OF WOLF-RAYET STARS: THE WN SUBCLASS Ph.D. Thesis
Douglas Nele Perry 1983 316 p
Avail: Univ. Microfilms Order No. DA8408064

The properties of the optical emission lines for more than 10 WN stars in the Galaxy and LMC both from an observational and theoretical standpoint. The equivalent widths for the prominent lines have been extracted and a significant diversity is found even between stars of similar subtypes. The ratios of line strengths for the ions used to define the subtypes suggest that the classification scheme is not solely an ionization one. Each of the above may have significant evolutionary consequences. The equivalent widths of the Pickering lines have been used to determine estimates of the H/He ratios. One third of the stars show evidence of H (some at all subtypes), with the greatest frequency and amounts among the later stars. H/He may in some cases reach 50% of the cosmic value. The C/N ratio is also estimated. The profiles have been extensively examined to note other differences between the lines in these stars. The full-widths follow the scatter present in equivalent widths, and a few conclusions will be drawn from their values. The dominant profiles shape observationally seems to be Gaussian, though 20% of the stars have one or more lines with enhanced emission far out into the wings. Dissert. Abstr.

N84-32312 Ohio State Univ., Columbus.
A SPECTROPHOTOMETRIC STUDY OF TEMPORAL VARIATIONS IN THE OPTICAL SPECTRUM OF SS 433 Ph.D. Thesis
Robert Mark Wagner 1984 127 p
Avail: Univ. Microfilms Order No. DA8410439

The unique emission-line star SS 433 was observed on 81 nights using the Ohio State University Image Dissector Scanner attached to the Perkins 1.8-M telescope of the Ohio Wesleyan and Ohio State Universities at Lowell Observatory. Continuum fitting indicated that the dominant source of optical luminosity in SS 433 resembles a heavily reddened (7.8 = to or < A (sub v) = to or < 8.2 magnitudes) hot black body with bar T > or = 32,500 K and bar R < of = to 34 solar radii. The Eddington luminosity constrains the mass of the continuum source to be M is = to or > 30 solar mass. The continuum source in SS 433 appears hotter when the processing body is seen nearest pole-on and cooler when seen equator-on. The variation in color temperature is in qualitative agreement with a von Zeipel gravity darkening law. Dissert. Abstr.

N84-32313 Illinois Univ., Urbana-Champaign.
THEORETICAL MODELS FOR THE POLARIZATION OF ASTRONOMICAL MASERS Ph.D. Thesis
Lonny Roy Western 1983 191 p
Avail: Univ. Microfilms Order No. DA8410071

Theoretical models for the creation of linear polarization in astronomical masers are developed. Equations are obtained that describe the transfer of the linearly polarized radiation in two and three dimensional astronomical masers. The transfer equations presented here include both polarization and intersecting maser rays. The transfer equations are integrated to find the intensity of radiation emitted by spheres, spherical shells and thin disks. The calculations show that apparent sizes due to beaming are still quite small and comparable to those obtained using the scalar molecular approximation. Long tails and substantial differences between the two linear polarizations occur in the angular distributions calculated here, especially for disk-like geometries, due to the effect of individual magnetic substates. Further calculations show that small anisotropies (approximately 10%) in the excitation can lead to very high linear polarization (approximately 90%) of the radiation from saturated astronomical masers. Separate calculations are performed for the transfer of the vibrational radiation of molecular SiO through a spherical gas shell. A major result is that magnetic fields alone can not account for the high linear polarization observations of the SiO v = 1, J = 2 ranges to 1 astronomical maser. Dissert. Abstr.

N84-32314 Massachusetts Univ., Amherst.
LINEAR POLARIZATION AND TOTAL FLUX DENSITY OF SILICON MONOXIDE MASERS AND ACTIVE EXTRAGALACTIC OBJECTS AT MILLIMETER WAVELENGTHS Ph.D. Thesis
Richard Edward Barvainis 1984 154 p
Avail: Univ. Microfilms Order No. DA8410258

In order to investigate the linear polarization properties of millimeter-wave radio sources, a polarimeter was constructed for use on the Five College Radio Astronomy Observatory 14m telescope. Linear polarization and total flux density observations of SiO masers (at 43 and 86 GHz) and active extragalactic objects (at 87 GHz) were conducted, resulting in the first multitransitional study of SiO maser polarization, and the first rapid time sampling (days to weeks) of extragalactic source polarization at millimeter wavelengths. A model is developed to explain the observed polarization and total intensity profiles of the Orion masers. The profiles can be simply accounted for by maser emission from a rotating and expanding disk, with an azimuthally dependent field orientation. Dissert. Abstr.

N84-32315*# Minnesota Univ., St. Paul.
STUDY OF VARIABLE EXTINCTION OF HOT STARS WITH CIRCUMSTELLAR DUST SHELLS Final Report
[1984] 2 p refs
(Grant NAG5-190)
(NASA-CR-173844; NAS 1.26:173844) Avail: NTIS HC A02/MF A01 CSCL 03A

Various projects on the topic of hot stars with circumstellar dust are reported. The surface temperature, wind speed, and interstellar reddening were determined for the variable WC7 star HD 193793. Circumstellar carbon monoxide molecules were detected around a hot star. The dust envelope of the star W90 in the young cluster NGC2264 is discussed, and the spectra of low-redshift and X-ray emitting quasars are mentioned. R.S.R.

N84-32316*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
ASTEROID LIGHT INVERSION Semiannual Status Report, 15 Feb. - 15 Aug. 1984
Steven J. Ostrow 10 Sep. 1984 24 p refs
(Grant NAGw-543)
(NASA-CR-173864; NAS 1.26:173864) Avail: NTIS HC A01/MF A01 CSCL 03A

The application of convex profile inversion (CPI) to the interpretation of asteroid lightcurves is discussed. This technique investigates the problem of extracting information about an asteroid's shape from its lightcurve. Whenever four ideal conditions are met, P is an estimator for the asteroids mean cross section C, a convex set defined as the average of all cross sections C(Z) cut by planes a distance z above the asteroids equatorial plane. C is therefore a 2-D average of the asteroids 3-D shape. The method is tested by inverting lightcurves generated analytically for geometrically scattered ellipsoids (GSE's) with semiaxes a < or = B < or = C. Using a defined 'distance measure' to quantify the difference between any two profiles, the deviation of P from C for GSE's as a function of lightcurve noise level, rotation phase sampling interval delta theta, and departure from ideal conditions is calibrated. The distance between P and a circle provides a gauge of the asteroid's nonsphericity and incorporates all the information contained in the lightcurve. E.R.

N84-32317*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
SIMULATION REQUIREMENTS FOR THE LARGE DEPLOYABLE REFLECTOR (LDR) Final Technical Report
Keto Soosaar Jul. 1984 29 p refs Sponsored in part by NASA. Ames Research Center
(Contract NAS8-34904)
(NASA-CR-171140; NAS 1.26:171140; CSDL-R-1725) Avail: NTIS HC A03/MF A01 CSCL 03A

Simulation tools for the large deployable reflector (LDR) are discussed. These tools are often the transfer function variety equations. However, transfer functions are inadequate to represent time-varying systems for multiple control systems with overlapping bandwidths characterized by multi-input, multi-output features. Frequency domain approaches are the useful design tools, but a full-up simulation is needed. Because of the need for a dedicated computer for high frequency multi degree of freedom components encountered, non-real time smulation is preferred. Large numerical analysis software programs are useful only to receive inputs and provide output to the next block, and should be kept out of the direct loop of simulation. The following blocks make up the simulation. The thermal model block is a classical heat transfer program. It is a non-steady state program. The quasistatic block deals with problems associated with rigid body control of reflector segments. The steady state block assembles data into equations of motion and dynamics. A differential raytrace is obtained to establish a change in wave aberrations. The observation scene is described. The focal plane module converts the photon intensity impinging on it into electron streams or into permanent film records. S.B.

N84-32318*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE DEPLOYABLE REFLECTOR SCIENCE AND TECHNOLOGY WORKSHOP. VOLUME 3: SYSTEMS AND TECHNOLOGY ASSESSMENT
Christopher A. Leidich, ed. and R. Bruce Pittman, ed. Jul. 1984 65 p refs Workshop held in Pacific Grove, Calif., 21-25 Jun. 1982 3 Vol.
(NASA-CP-2275-Vol-3; A-9341-Vol-3; NAS 1.55:2275-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 03A

The results of five technology panels which convened to discuss the Large Deployable Reflector (LDR) are presented. The proposed LDR is a large, ambient-temperature, far infrared/submillimeter telescope designed for space. Panel topics included optics, materials and structures, sensing and control, science instruments, and systems and missions. The telescope requirements, the estimated technology levels, and the areas in which the generic technology work has to be augmented are enumerated. For individual titles, see N84-32319 through N84-32321.

N84-32319*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE DEPLOYABLE REFLECTOR SCIENCE AND TECHNOLOGY WORKSHOP. VOLUME 3: SYSTEMS AND TECHNOLOGY ASSESSMENT. INTRODUCTION
In its Large Deployable Reflector Sci. and Technol. Workshop. Vol. 3: Systems and Technol. Assessment Jul. 1984 p 1-7 (For primary document see N84-32318 21-89)
Avail: NTIS HC A04/MF A01 CSCL 03A

The Large Deployable Reflector (LDR), a proposed 20 m diameter telescope designed for infrared and submillimeter astronomical measurements from space, is discussed in terms of scientific purposes, capabilities, current status, and history of development. The LDR systems goals and functional/telescope requirements are enumerated. R.S.F.

N84-32320*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TECHNOLOGY PANEL REPORTS
In its Large Deployable Reflector Sci. and Technol. Workshop. Vol. 3: Systems and Technol. Assessment Jul. 1984 p 8-47 (For primary document see N84-32318 21-89)
Avail: NTIS HC A04/MF A01 CSCL 03A

Results are presented from five technology panels which convened to identify relevant technologies within their discipline for the Large Deployable Reflector (LDR) and to assess the current and projected state of these technologies. The five panels considered the following topics: optics, materials and structure, sensing and control, science instruments, and systems and missions. R.S.F.

N84-32321*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE DEPLOYABLE REFLECTOR SCIENCE AND TECHNOLOGY WORKSHOP. VOLUME 3: SYSTEMS AND TECHNOLOGY ASSESSMENT. CONCLUSIONS
In its Large Deployable Reflector Sci. and Technol. Workshop. Vol. 3: Systems and Technol. Assessment Jul. 1984 p 48-54 refs (For primary document see N84-32318 21-89)
Avail: NTIS HC A04/MF A01 CSCL 03A

The physical parameters of the Large Deployable Reflector (LDR) required to achieve the anticipated astronomical objectives are reviewed briefly. System parameters and performance requirements for the LDR are enumerated. The LDR was compared with the Cosmic Background Experiment (COBE), the Infrared Astronomical Satellite (IRAS), and the Space Infrared Telescope Facility (SIRTF). Angular resolution and high resolution spectroscopy requirements for LDR were considered. R.S.F.

N84-32322# Los Alamos Scientific Lab., N. Mex.
THEORETICAL STUDY OF CEPHEID LIGHT CURVES
C. G. Davis May 1984 5 p refs Presented at the 82nd IAU Colloq., Toronto, 29 May - 1 Jun. 1984
(Contract W-7405-eng-36)
(DE84-012453; LA-UR-84-1640; CONF-8405180-1) Avail: NTIS

HC A02/MF A01

Pulsation in variable stars which was considered to be caused by the heat engine of Hydrogen and Helium ionization in their atmospheres it was found that nonlinear effects were responsible for the detailed features on their light and velocity curves. The coupled set of hydrodynamics and radiation diffusion equations to model these nonlinear features were computated. Recent model results for long period (LP) Cepheids in an attempt to get another handle on Cepheid masses. These results are discussed and the implications of these model results on the problem of the Cepheid mass discrepancy are considered. DOE

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-32323 California Univ., Los Angeles.
ON THE MASSES OF WHITE DWARFS IN CATACLYSMIC BINARIES Ph.D. Thesis
Allen Wayne Shafter 1983 230 p
Avail: Univ. Microfilms Order No. DA8409238

The indirect method of determining the masses of the white dwarfs in cataclysmic binaries was reexamined. This method is based on the assumption that the quantity K sub 1/ is a function only of the mass ratio of the binary. In the above relationship K sub 1 is the velocity semiamplitude of the white dwarf and v sub d sin i is the projected circular velocity of material in the accretion disk having the same specific angular momentum as the material leaving the inner Lagrangian point. Eleven cataclysmic binaries were observed with directly determined mass ratios in order to ascertain what position in the emission line profile best represents v sub d sin i. It is concluded that the method is useful and masses for 20 single-lined cataclysmic binaries were derived. The individual white dwarf masses are typically accurate to better than 30%. The radial velocity curves for 13 of the 20 systems, V794 Aq1, KR Aur, V425 Cas, SY Cnc, YZ Cnc CM Del, T Leo, V380 Oph, V422 Oph, SW UMa, UX UMa, TW Vir, and VW Vul were determined. By adopting the masses for the 20 single-lined systems and those from the calibration systems, a weak correlation is found between the white dwarf mass and the orbital period of the binary. Dissert. Abstr.

N84-32324 Rochester Univ., N. Y.
OPTICAL AND INFRARED POLARIZATION AS A PROBE OF MATTER NEAR STARS Ph.D. Thesis
Marc George Lacasse 1984 204 p
Avail: Univ. Microfilms Order No. DA8409148

Polarization because of its strong dependence on the presence and size of dust grains as well as the position and extent of the scattering medium, is an excellent probe of material near stars. The distribution of the polarization's position angles in a nebula provide a series of sign posts whereby the location of the principal source of illumination may be determined. The level of polarization is indicative of the amount of scattering in the nebula and may be used to infer the number density of scatterers. The positional dependence of the polarization in nebulae surrounding several stars determined in the infrared and in the optical was to gain understanding of this interstellar medium close to the stars. Polarization maps were obtained and to assist in the interpretation of these brightness of singly and doubly scattered light from a star were calculated for grains distributed uniformly in a slab geometry. Scattering properties of the grains were calculated from Mie theory. The observations presented herein reveal that scattering often provides a significant part of the observed radiation from the regions around stars. Dissert. Abstr.

N84-32325 Illinois Univ., Urbana-Champaign.
THE PHYSICAL NATURE OF THE SYMBIOTIC STARS Ph.D. Thesis
Scott Jay Kanyon 1983 357 p
Avail: Univ. Microfilms Order No. DA8409968

The physical nature of the peculiar emission-line objects known as symbiotic stars is examined. The available observations of these objects can be understood best if they are binaries consisting of a late-type giant and a hot component which ionizes a gaseous nebula. New 2 to 4 micron low resolution spectra of symbiotic stars are compared to spectra of normal M-type giants and supergiants. The 14 symbiotics observed have the strong CO absorption band at 2.29 microns that is characteristic of M-type giants and supergiants. CI Cyg, T CrB and Z And have CO bands which are comparable in strength to some M-type supergiants and bright giants, suggesting these systems contain very evolved stars on the asymptotic giant branch. The remaining systems have CO bands resembling those observed in normal M-type giants. New optical spectrophotometric observations show long-term variability in Z And, CI Cyg and AX Per which appear to be eclipses. An analysis of the strong H I, He I and He II emission lines implies effective temperatures of 100,000 K and luminosities of 1000 L (solar) are appropriate for most symbiotic hot components. The (O III) and (Fe VII) line intensities require low density nebulae in some symbiotics and high density nebulae in others. Spectrum synthesis techniques were used to determine the physical nature of symbiotic hot components. Dissert. Abstr.

N84-32326 Massachusetts Univ., Amherst.
THE KINEMATICS OF THE EMISSION LINE GAS IN QUASARS AND ACTIVE GALACTIC NUCLEI Ph.D. Thesis
Timothy John Carroll 1984 143 p
Avail: Univ. Microfilms Order No. DA8410270

A kinetic model is proposed in which the broad-line emission clouds orbit the central continuum source in nearly parabolic orbits in order to produce a symmetric Lyman alpha profile in spite of the angular asymmetry in the Lyman alpha emission from an individual optically thick cloud. Theoretical profiles are generated and compared with logarithmic lines shapes, and this model was compared with others proposed. The forbidden line spectrum of quasars and Seyfert galaxies was examined in light of the various proposed kinematic models for the broad-line regions of these objects. The parabolic-orbital model for the broad emission line regions of quasars and Seyfert galaxies was extended to include the effects of a finite infalling cloud number and size. Disruption of the cloud by tidal forces results in a large velocity dispersion among the resulting fragment cloudlets. The drag of a confining intercloud wind was also considered. The major dynamical effect of this drag is trap clouds with less than a certain angular momentum. The trapping of clouds produces an asymmetry in the Lyman alpha profile due to the absence of an outward leg for the trapped clouds. Dissert. Abstr.

N84-32327*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
GEOLOGICAL RHYTHMS AND COMETARY IMPACTS
Michael R. Rampino and Richard B. Strothers 7 Aug. 1984 22 p refs Revised Submitted for publication
(NASA-TM-86116; NAS 1.15:86116) Avail: NTIS HC A02/MF A01 CSCL 03B

Time series analysis reveals two dominant, long-term periodicities approximately equal to 32 and 260 million years in the known series of geological and biological upheavals during the Phanerozoic Eon. The cycles of these episodes agree in period and phase with the cycles of impact cratering on Earth, suggesting that periodic comet impacts strongly influence Earth processes. Author

N84-32328*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDIES OF LOW-MASS STAR FORMATION WITH THE LARGE DEPLOYABLE REFLECTOR
A. G. G. M. Tielens and D. J. Hollenbach Jul. 1984 28 p refs
(NASA-TM-85960; A-9754; NAS 1.15:85960) Avail: NTIS HC A03/MF A01 CSCL 03B

Estimates are made of the far-infrared and submillimeter continuum and line emission from regions of low mass star formation. The intensity of this emission is compared with the

sensitivity of the large deployable reflector (LDR), a large space telescope designed for this wavelength range. The proposed LDR is designed to probe the temperature, density, chemical structure, and the velocity field of the collapsing envelopes of these protostars. The LDR is also designed to study the accretion shocks on the cores and circumstellar disks of low-mass protostars, and to detect shock waves driven by protostellar winds. R.S.F.

N84-32329# Argonne National Lab., Ill. Applied Physics Div.
GALACTIC CYCLES AND THEIR RELATIONSHIP TO LIFE ON EARTH
Arne P. Olson 1984 23 p refs Presented at the Inner Space/Outer Space Conf., Batavia, Ill., 2-5 May 1984
(Contract W-31-109-eng-38)
(DE84-011737; CONF-8405155-2) Avail: NTIS HC A02/MF A01

Episodic events in the geologic time scale of the evolution of life on earth and potentially cyclic behavior relative to galactic structure are discussed. The question is a simple one: Do galactic processes affect the solar system. It is known that the sun is moving at about 220 plus or minus 15 km/sec at a distance of about 8.5 plus or minus 0.5 kpc from the galactic center. This motion, if circular and unperturbed, implies an orbital period of 237 plus or minus 21 My for the solar system around the galaxy. The Milky Way also evidences structure typically interpreted as spiral arms, in the distribution of gas clouds in its central plane. The relative motion of the spiral arms, known as the pattern speed, is about 2/3 that of the sun. Consequently the solar system gains upon and passes through all the structure in its orbital plane once in three rotations or approx. 700 My. If this structure is persistent over times longer than 700 My, it is clear that the interaction (if any) can be called cyclic. Furthermore, if there is any sub-structure or inner pattern to the 700 My cycle, it may show up as higher harmonics. Age estimates for the Milky Way are 12-15 By, or approx. 17 to 22 structure cycles of 0.70 By. It seems not unreasonable to expect some persistence of a pattern over a few structure cycles. It must be noted that the pattern speed is quite uncertain. Perhaps geophysical evidence can be used to improve on the nominally 700 My structure cycle which is assumed here are discussed. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N84-32330* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHOBOS: CLOSE ENCOUNTER IMAGING FROM THE VIKING ORBITERS
Thomas C. Duxbury, John D. Callahan, and Adriana C. Ocampo Jul. 1984 56 p
(NASA-RP-1109; NAS 1.61:1109) Avail: NTIS HC A04 CSCL 03B

The shape and orbital characteristics of Phobos, the larger and innermost of Mars' two irregular moons, are discussed and illustrated. Also presented are the high resolution pictures of Phobos that were obtained during the close flybys of Viking Orbiters 1 and 2. The viewing geometry is also given for each picture. E.R.

N84-32331 Stanford Univ., Calif.
RADIO SCINTILLATIONS OBSERVED DURING ATMOSPHERIC OCCULTATIONS OF VOYAGER: INTERNAL GRAVITY WAVES AT TITAN AND MAGNETIC FIELD ORIENTATIONS AT JUPITER AND SATURN Ph.D. Thesis
David P. Hinson 1984 196 p
Avail: Univ. Microfilms Order No. DA8408299

A technique was developed and applied in order to objectively analyze the radio scintillations observed during planetary occultations of Voyager. Temporal spectra of the weak fluctuations in amplitude and phase are interpreted using the theory for scattering from a random distribution of anisotropic irregularities embedded in a thin screen. For Jupiter and Saturn, this study considers only data pertaining to irregularities in the upper ionospheres. Magnetic field orientations in the ionospheres of Jupiter and Saturn were inferred from the direction of alignment of the irregularities. The occultation measurements conflict the predictions of Jovian magnetic field models, but generally confirm current models of Saturn's field. During the occultation of Voyager 1 by Titan, refractive irregularities of size 0.2 to 2 km distributed throughout the lowest 90 km of the atmosphere caused appreciable signal fluctuations. Analysis of measured spectra yielded evidence of horizontal variations in gas density, and hence dynamics. Above 25 km, the altitude profile of intensity scintillations closely agrees with the predictions of a theory based on the characteristics of freely propagating internal gravity waves. These observations demonstrate the presence on Titan of atmospheric gravity waves, possibly driven by a convective region near the surface.
Dissert. Abstr.

N84-32332 Colorado Univ., Boulder.
ATOMIC CARBON IN THE VENUS THERMOSPHERE: OBSERVATIONS AND THEORY Ph.D. Thesis
Larry Jason Paxton 1983 257 p
Avail: Univ. Microfilms Order No. DA8408061

Pioneer Venus Orbiter Ultraviolet Spectrometer (PVOUVS) observations at 166 and 156 nm were analyzed. A high altitude component due to nonthermal carbon was identified. The hot atoms are created at the exobase in collisions between the thermal carbon and hot oxygen atoms. In order to calculate the hot carbon distribution the energy distribution of the hot oxygen was determined. The major source of hot O in the Venus thermosphere is the dissociative recombination of O2(+) with energies. Lower in the thermosphere PVOUVS observations of the carbon multiplets included contributions from the Fourth Positive CO bands. The CI multiplet radiative transfer problem was solved using a carbon distribution determined from photochemical models. The major source of radiation between 160 and 240 km is the resonant scattering of solar photons. Dissociative excitation of CO2 is the major low altitude CI source. Since the carbon density is sensitive to the O2 mixing ratio, which is unknown, the observed CI intensity can be used to estimate the thermospheric O2 content.
Dissert. Abstr.

N84-32333*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE AMPLITUDE MHD WAVES UPSTREAM OF THE JOVIAN BOW SHOCK: REINTERPRETATION
Melvyn L. Goldstein, Hung K. Wong, Adolfo F. Vinas, and Charles W. Smith (New Hampshire Univ.) Jul. 1984 34 p refs
(NASA-TM-86131; NAS 1.15:86131) Avail: NTIS HC A03/MF A01 CSCL 09B

Observations of large amplitude magnetohydrodynamic (MHD) waves upstream of the Jovian bow shock were previously interpreted as arising from a resonant electromagnetic ion beam instability. That interpretation was based on the conclusion that the observed fluctuations were predominantly right elliptically polarized in the solar wind rest frame. Because it was noted that the fluctuations are, in fact, left elliptically polarized, a reanalysis of the observations was necessary. Several mechanisms for producing left hand polarized MHD waves in the observed frequency range were investigated. Instabilities excited by protons appear unlikely to account for the observations. A resonant instability excited by relativistic electrons escaping from the Jovian magnetosphere is a likely source of free energy consistent with the observations. Evidence for the existence of such a population of electrons was found in both the Low Energy Charged Particle experiments and Cosmic Ray experiments on Voyager 2. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-32334 Princeton Univ., N. J.
THE SHAPE OF THE SUN Ph.D. Thesis
Kenneth George Libbrecht 1984 143 p
Avail: Univ. Microfilms Order No. DA8409631

The design, construction, and operation of a telescope capable of measuring the shape of the Sun to an accuracy of about one milliarcsecond are described. The instrument has added angular resolution around the solar limb to detect the presence of photospheric faculae and sunspots. Solar oblateness was measured during a five month period. There is some indication in the data that there exists a polar temperature excess of T sub pole - T sub equator is approximately equal to 4 C in the quiet photosphere. Solar faculae and anomalous lensing effects in the Earth's atmosphere were found to be the major sources of systematic error in the measurement. Dissert. Abstr.

N84-32335 California Univ., San Diego.
OBSERVATIONS AND ANALYSIS OF SOLAR FLARES USING H ALPHA SPECTRAL PROFILES Ph.D. Thesis
Todd Alan Gunkler 1984 161 p
Avail: Univ. Microfilms Order No. DA8406721

The temperature and density structure of the solar chromosphere during a flare hole information about energetic flare processes. Since the form of the H sub alpha spectra line is very sensitive to the chromospheric temperature and density distribution. H sub alpha profile observations can help us learn about fast particles, enhanced pressure, enhanced thermal conduction, chromospheric evaporation, mass motion, and other flare effects. The chromospheric flare problem was approached in three steps: analysis of an observed flare using existing empirical models, development of physical models of H sub alpha, and analysis of another observed flare using these physical models. It is shown that chromospheric evaporation takes place concurrently with enhancement of the overlying coronal density. In addition, it is shown that only high fluxes of nonthermal electrons produce broad, nonGaussian profile wings, and that only high values of the coronal pressure remove the central reversal of the profiles. It was demonstrated that nonthermal electrons were accelerated bidirectionally within coronal loops and injected into the chromosphere at the loop footpoints. All of the observed hard X-ray flux can be explained by nonthermal bremsstrahlung. Chromospheric evaporation is shown to be adequate to provide the coronal flare plasma. Dissert. Abstr.

N84-32336# Louisiana State Univ., Baton Rouge.
SOLAR FLARES AND MAGNETOSPHERIC PARTICLES: INVESTIGATIONS BASED UPON THE ONR-602 EXPERIMENT Annual Report
J. P. Wefel 18 Jul. 1984 17 p
(Contract N00014-83-K-0365)
(AD-A143144) Avail: NTIS HC A02/MF A01 CSCL 03/2

Investigations of the South Atlantic Anomaly region, the global distribution of low energy magnetospheric particles, and of the time dependence of the low energy particle fluxes have been initiated. Further, an initial analysis of the mass and charge composition of the solar energetic particles observed, over the polar regions, during the mission was completed. The remainder of this report will summarize the following topics: (1) Data processing/analysis, (2) Solar Energetic Particle composition (3) Global surveys of low energy particle radiation, and (4) The South Atlantic Anomaly region. B.W.

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-32337*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TWO PROBABLE OPTICAL FLASHES FROM GAMMA-RAY BURSTERS
Bradley E. Schaefer, H. V. Bradt, C. Barat, K. Hurley, M. Niel, G. Vedrenne, T. L. Cline, U. Desai, B. G. Teegarden, and W. D. Evans Jul. 1984 15 p refs Submitted for publication
(NASA-TM-86126; NAS 1.15:86126) Avail: NTIS HC A02/MF A01 CSCL 03B

Two images on archival photographic plates which are most likely records of optical flashes from gamma-ray bursters (GRBs) were examined. One of these images appears on a 1901 plate in the field of the 5 Nov. 1979 GRB, while the other is in the field of the 13 Jan. 1979 GRB on a plate exposed in 1944. The 1901 optical transient image is circular in shape, while all normal star images are trailed by 8 in. No optical transients are found in a control region which is 34.3 times larger than the GRB error regions examined. Independent limits on the optical flash rate from the sky yield a probability of less than 0.0001 that any one of the optical transients is due to a background flash. A total exposure of 2.7 years was examined for GRB flashes at known GRB locations on the Harvard plates and a total of three GRB flashes were seen, that the average recurrence time scale for optical flashes is roughly one year. The optical fluence of these optical flashes was measured. For the three currently known GRB optical flashes, the ratio of gamma-ray fluence (from a modern burst) to the optical fluence (from a archival burst) were measured to be 800, 900, and 900. Author

N84-32338*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PHOTON-PHOTON ABSORPTION AND THE UNIQUENESS OF THE SPECTRA OF ACTIVE GALACTIC NUCLEI
Demosthenes Kazanas May 1984 16 p refs
(NASA-TM-86117; NAS 1.15:86117) Avail: NTIS HC A02/MF A01 CSCL 03B

The effects of the feedback of e(+)-e(-) pair reinjection in a plasma due to photon-photon absorption of its own radiation was examined. Under the assumption of continuous electron injection with a power law spectrum E to the minus gamma power and Compton losses only, it is shown that for gamma < 2 the steady state electron distribution function has a unique form independent of the primary injection spectrum. This electron distribution function can, by synchrotron emission, reproduce the general characteristics of the observed radio to optical active galactic nuclei spectra. Inverse Compton scattering of the synchrotron photons by the same electron distribution can account for their X-ray spectra, and also implies gamma ray emission from these objects. This result is invoked to account for the similarity of these spectra, and it is consistent with observations of the diffuse gamma ray background. R.S.F.

N84-32339# Argonne National Lab., Ill.
THREE-DIMENSIONAL MODEL FOR FUSION PROCESSES
Arne P. Olson 1984 24 p refs Presented at the Inner Space/Outer Space Conf., Batavia, Ill., 2 May 1984
(Contract W-7405-eng-38)
(DE84-011731; CONF-8405155-1) Avail: NTIS HC A02/MF A01

A coherent phenomenological model based on fusion processes is discussed. Some areas of concern about active galactic nuclei are what drives the galactic engine; what and where are the mass flows of fuel to the engine; are there more than one engine; do the engines have any symmetry properties; is observed radiation isotropically emitted from the source; if it is polarized, what causes the polarization; and why is there a roughly

spherical cloud of ionized gas about the center of our galaxy. A unified model of fusion processes applicable to many astronomical phenomena is proposed and discussed. DOE

99 GENERAL

N84-32340# Council for Scientific and Industrial Research, Pretoria (South Africa).
[CSIR ACTIVITIES IN SOUTH AFRICA] Annual Report
1983 74 p Original contains color illustrations
(ISBN-0-7988-3029-8; ISSN-0370-8454) Avail: NTIS HC A05/MF A01

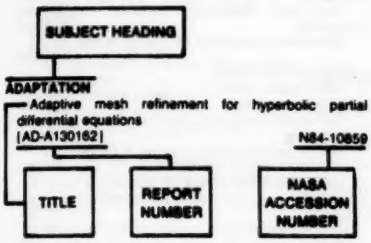
The activities of the Council For Scientific and Industrial Research is examined through their diverse subsidiaries. Topics include current research status in the engineering sciences, physics technological sciences, chemistry, Earth sciences, astronomy and land surveying, mathematics, human sciences, and the life sciences. A detailed financial statement is also provided. M.A.C.

N84-32341# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS
Jul. 1984 127 p In FRENCH and ENGLISH
(AGARD-CAL-84/1; ISBN-92-835-0356-2) Copyright. Avail: NTIS HC A07/MF A01

The dates, locations, times, and sponsors are provided for technical meetings, conferences, and symposia to be held, in all parts of the world, in the field of aerospace research and development as well as in other directly related fields such as energy, geophysics, and acoustics. Exhibitions (technical displays) and educational courses given by specialized institutions are included. Topics of interest include: aerospace medicine and biology; electronics, optics, and metrology; flight mechanics; fluid dynamics and acoustics; navigation, guidance, and control; thermodynamics, combustion, propulsion, and energetics; structures, materials, and applied mechanics; atmospheric physics and Earth environment; information, documentation, and data processing; and interdisciplinary aspects. A.R.H.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

A

ABERRATION
Generation and application of finely focused low energy electron beams N84-32129

ABILITIES
Variability of practice and the transfer of training of motor skills
[AD-A142896] N84-31942

ABRASION RESISTANCE
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-081] N84-31659

ABRASIVES
New sapphire and ruby components and their manufacture using diamond abrasives
[CSIR-TRANS-1734] N84-31419
Grinding with Borazon: Progress and rewards
[CSIR-TRANS-1718] N84-31420
Internal grinding of high-speed steels: Shorter processing times with boron nitride grinding tools
[CSIR-TRANS-1719] N84-31421

ABSORPTANCE
Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094

ABSORPTION SPECTRA
Design of short-wave absorption lines N84-31433
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040

ABSORPTIVITY
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489

ABSTRACTS
Environmental Research Laboratories publication abstracts, FY 1983
[PB84-189323] N84-31892
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature
[AD-A142981] N84-31912
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221

ACCELERATION (PHYSICS)
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Relativistic vector sub p x vector sub b acceleration of charged particles by an obliquely propagating electrostatic wave
[IPPJ-680] N84-32183

ACCESS CONTROL
DEC LSI-11/HP9895A software
[DE84-012412] N84-31952
HEART OF GOLD: Computer routines for large sparse, least squares computations
[PB84-196492] N84-31987

ACCIDENTS
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185

ACCOUNTING
Accounting utility for determining individual usage of production level software systems
[NASA-CR-172414] N84-31959
Cost and schedule control systems criteria for contract performance measurement, information pamphlet
[DE84-012576] N84-32269

ACCURACY
Warheads for SAM systems N84-31257

ACETYL COMPOUNDS
Modulation of the cholinergic mechanisms in the bronchial smooth muscle
[NDRE/PUBL-84-1001] N84-31937

ACOUSTIC ATTENUATION
Resolution and quantitative accuracy improvements in ultrasound transmission imaging N84-32113
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173848] N84-32115
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116

ACOUSTIC EMISSION
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
A comprehensive guide to the literature on acoustic emission from composites
[DE84-011064] N84-31296
Sound field of turbulent wake N84-32048

ACOUSTIC EXCITATION
Acoustic excitation: A promising new means of controlling shear layers
[NASA-TM-83772] N84-31096
Electromagnetic excitation of sound in metals N84-32082

ACOUSTIC MEASUREMENT
A comprehensive guide to the literature on acoustic emission from composites
[DE84-011064] N84-31296
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173848] N84-32115
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117
The discrimination of pitch in pulse trains and speech
[AD-A142996] N84-32127

ACOUSTIC PROPAGATION
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111
Time dependent wave envelope finite difference analysis of sound propagation
[NASA-TM-83744] N84-32118
Acoustic propagation in a termally stratified atmosphere
[NASA-CR-173863] N84-32121

ACOUSTIC PROPERTIES
Dependence of acoustic properties of sound absorbing fibrous materials on their structure N84-32044

ACOUSTIC VELOCITY
D...sion transfer during near-sonic turbulence N84-32090

ACOUSTICS
The acoustic design of outside broadcast vehicles
[BBC-RD-1984/3] N84-31454
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Agglomeration and peciptation by sonic-inertial means: Abstract of the state of the art
[REPT-0563/84] N84-32125
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32128

ACOUSTO-OPTICS
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
Optically pumped polarized alkali atomic beams and targets
[DE84-012389] N84-32147

ACQUISITION
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247

ACTIVATION
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31763

ACTIVE CONTROL
Unsteady aerodynamics of fast moving control surfaces
[BMFT-FB-W-84-020] N84-31117
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173868] N84-31214
Active controls: A look at analytical methods and associated tools
[NASA-TM-86269] N84-31684
Compensating technique using one active control scheme to nullify the acummulated effect of modelling deviation
[INPE-3181-PRE/546] N84-31996

ACTIVITY (BIOLOGY)
Psychophysiological aspects of monotonous human activity N84-31911

ACTUATORS
Digital rotation measurement unit
[DE84-010872] N84-31528
Optimum control of electric motor drives for industrial robots
[DE84-012878] N84-31543

ADA (PROGRAMMING LANGUAGE)
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
Feasibility assessment of JOVIAL to Ada (Trademark) translation
[AD-P003523] N84-31127
The impact of NEBULA, MCF (Military Computer Family), and Ada (Trademark) on real-time embedded computer systems
[AD-P003534] N84-31136
Ada (Trademark) as a program design language. A rational approach to transitioning industry to the world of Ada through a program design language criteria
[AD-P003556] N84-31160
The KAPSE (Kernel Ada (Trademark) Programming Support Environment) interface team
[AD-P003557] N84-31161
The Ada (Trademark) run-time environment
[AD-P003558] N84-31162
A code of practice to constrain Ada (Trademark)
[AD-P003559] N84-31163
Ada (Trademark) training considerations
[AD-P003560] N84-31164

Architectural and control considerations for a high speed signal processor implemented with an Ada (Trademark) executive
[AD-P003594] N84-31199
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Ada (trade name) orientation for managers L101 teacher's guide
[AD-A141846] N84-31968

ADAPTATION
Stability of physiological and psychological human functions under extreme environmental conditions N84-31910

ADAPTIVE CONTROL
An on-line equivalent system identification scheme for adaptive control N84-31213
An adaptive attitude controller for terrestrial artificial satellites
[INPE-3166-PRE/551] N84-31243
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943

ADAPTIVE FILTERS
Compensating technique using one active control scheme to nullify the acummulated effect of modelling deviation
[INPE-3161-PRE/546] N84-31996

ADDITIVES
Advantages of metallic fuels for rocket propulsion N84-31237
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Status of the development of a long-life engine coolant system
[AD-A143098] N84-31642
Experiments in development of powerful dye laser N84-32095
Studies of hydrogenated amorphous silicon
[DE84-011888] N84-32211

ADHESION
Adhesion between polymers and evaporated gold and nickel films
[NASA-TP-2360] N84-31379

ADHESION TESTS
Adhesion between polymers and evaporated gold and nickel films
[NASA-TP-2360] N84-31379
Creep of six glues
[CETIM-1.3N.16.2] N84-31398

ADHESIVE BONDING
Bonding prospectives in Japan
[CETIM-100-14-0] N84-31397
Nondestructive testing of bonding by ultrasonic analysis: Preliminary study report proposed investigation program — metal bonding
[CETIM-13-V-010] N84-31660

ADHESIVES
Bonding prospectives in Japan
[CETIM-100-14-0] N84-31397

ADIABATIC CONDITIONS
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306

ADJUSTING
Temperature controlled adjusting mechanism
[AD-D011077] N84-31601

ADRENAL METABOLISM
Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929

ADSORPTION
Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy
[DE84-009246] N84-31327

AERIAL PHOTOGRAPHY
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31766

AERIAL RECONNAISSANCE
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725

AEROACOUSTICS
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167666] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167665] N84-31261

AERODYNAMIC CHARACTERISTICS
Potential application of artificial concepts to aerodynamic simulation
[NASA-TM-85976] N84-31093
A review of some Reynolds number effects related to bodies at high angles of attack
[NASA-CR-3809] N84-31097
Aerothermodynamic data base, phase C
[NASA-CR-173862] N84-31259
Splash and spray from road vehicles and associated topics: A bibliography
[CAR-8425] N84-31557

AERODYNAMIC DRAG
Wing design for minimum drag with practical constraints N84-31109

AERODYNAMIC FORCES
Gasdynamic study of model with combustion in shock tunnel N84-32061

AERODYNAMIC INTERFERENCE
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090

AERODYNAMIC LOADS
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167666] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167665] N84-31261
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86280] N84-31560

AERODYNAMIC STALLING
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554

AERODYNAMICS
Computational aerodynamics and artificial intelligence
[NASA-TM-85994] N84-31089
Report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A143023] N84-31103
Unsteady aerodynamics of fast moving control surfaces
[BMFT-FB-W-84-020] N84-31117

AEROELASTICITY
Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion
[NASA-CR-3822] N84-31216
Active controls: A look at analytical methods and associated tools
[NASA-TM-86269] N84-31684

AERONAUTICAL ENGINEERING
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
Graduate engineering research participation in aeronautics
[NASA-CR-173849] N84-32220
Calender of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341

AEROSOLS
Total aerosol volume computed from laser spectrometer particle-size data for comparison with flame photometer total-mass data
[AD-A143171] N84-31306
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171117] N84-31835
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171116] N84-31836
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171127] N84-31837
Double scattering background in a CW lidar N84-32072
Agglomeration and precipitation by sonic-inertial means: Abstract of the state of the art
[REPT-0563/84] N84-32126

AEROSPACE ENGINEERING
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221
Calendar of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341

AEROSPACE ENVIRONMENTS
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
Medical research in first 100 days of Salyut-7 flight N84-31230
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232

AEROSPACE MEDICINE
USSR report: Space
[JPRS-USP-84-004] N84-31228
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
Medical research in first 100 days of Salyut-7 flight N84-31230
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature
[AD-A142961] N84-31912
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58262] N84-31935

AEROTHERMODYNAMICS
Aerothermodynamic data base, phase C
[NASA-CR-173862] N84-31259
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86280] N84-31560
Hypersonic three-dimensional flow of radiating gas around wing N84-32062

AFFERENT NERVOUS SYSTEMS
Correlation of afferent activity and binocular receptive field properties
[AD-A143087] N84-31938

AFRICA
African Doppler Surveys (ADOS)
[AD-A142736] N84-31764

AGE FACTOR
Age-related responses to de- and hyperhydration N84-31905

AGGLOMERATION
Agglomeration and precipitation by sonic-inertial means: Abstract of the state of the art
[REPT-0563/84] N84-32126

AGING (BIOLOGY)
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential
[DE84-012404] N84-31852

AGING (MATERIALS)
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites
[NASA-CR-173870] N84-31289
Viscoelastic and aging characteristics of polymers
[DE84-012669] N84-31393

AGRICULTURE
Producer gas: Another fuel for motor transport
[DE84-901066] N84-31416
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-017] N84-31924

AGRISTARS PROJECT
A method to combine remotely sensed and in situ measurements: Program documentation
[E84-10172] N84-31736

AILERONS
Acoustic tests of the MOD-0/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120

AIR
Analytical methods for determination of inorganic anions
[BLL-WH-592-(9091.9F)] N84-31301
Stretch effects in plane premixed hydrogen-air flames
[DE84-012035] N84-31311
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323

AIR COOLING
Increase of efficiency in cooled high temperature turbines
[BMFT-FB-W-84-019] N84-31212

AIR DEFENSE
Concepts for LHX avionics
[AD-P003575] N84-31180
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
Missile system for low altitude air defence N84-31255

AIR FLOW
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142840] N84-31100

AIR POLLUTION
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459

AIR QUALITY
Urban and local source effects on precipitation chemistry
[DE84-011848] N84-31803

AIR TO AIR REFUELING
Microprocessors in aircrew training devices
[AD-P003485] N84-32252

AIR TO SURFACE MISSILES
Application of 1553B to MRASM (Medium Range Air to Surface Missile): A systems look
[AD-P003540] N84-31144
MIL-STD-1553B in MRASM (Medium Range Air to Surface Missile): The designer's challenge
[AD-P003541] N84-31145

AIR TRAFFIC
National Airspace Review: Implementation plan
N84-31107

AIR TRAFFIC CONTROL
National Airspace Review: Implementation plan
N84-31107
Distributed problem solving for air fleet control: Framework and implementations
[AD-A143168] N84-31108

AIR WATER INTERACTIONS
Proceedings of the 6th Annual Climate Diagnostics Workshop
[PB84-192418] N84-31893

AIRBORNE EQUIPMENT
Airborne wind measurements at Cape Blanco, Oregon
[DE84-013662] N84-31880

AIRBORNE/SPACEBORNE COMPUTERS
Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112
Transportable GPU (General Processor Units) chip set technology for standard computer architectures
[AD-P003553] N84-31157
MIL-STD-1750A as a spaceborne instruction set architecture
[AD-P003554] N84-31158
The application of standards to the TDY-750 (TIGERSHARK) mission computer
[AD-P003567] N84-31172
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260

AIRCRAFT
Oscillations of elastic airplane due to wind gust
N84-32087

AIRCRAFT ANTENNAS
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477

AIRCRAFT COMMUNICATION
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477

AIRCRAFT COMPARTMENTS
Report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A143023] N84-31103
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117
Analytical model of the structureborne interior noise induced by a propeller wake
[NASA-CR-172381] N84-32119

AIRCRAFT CONSTRUCTION MATERIALS
Modern structure materials: Present situation and evolution perspectives — aircraft construction materials
[SNIAS-841-551-103] N84-31118
Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites
[SNIAS-841-551-102] N84-31298
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

AIRCRAFT CONTROL
Oscillations of elastic airplane due to wind gust
N84-32087
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250

AIRCRAFT DESIGN
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173866] N84-31214
The influence of Computer Aided Design (CAD) on research — aircraft design
[NLR-MP-83026-U] N84-31984
Oscillations of elastic airplane due to wind gust
N84-32087
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116

AIRCRAFT ENGINES
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Using gas-turbine power stations with aircraft engines for power-and-heat generation
[AD-A142084] N84-31786

AIRCRAFT EQUIPMENT
Simulated crash decelerations in a light aircraft cabin
[AD-A142806] N84-31102
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142946] N84-31948

AIRCRAFT GUIDANCE
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215

AIRCRAFT HAZARDS
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848

AIRCRAFT INDUSTRY
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973

AIRCRAFT LANDING
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215

AIRCRAFT MAINTENANCE
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study
[AD-A143104] N84-31211
On-line task analyses in maintenance simulation
[AD-P003452] N84-32229

AIRCRAFT MANEUVERS
Extensions and modifications to the ARL point-performance program
[AD-A142078] N84-31113
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261

AIRCRAFT NOISE
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117
Analytical model of the structureborne interior noise induced by a propeller wake
[NASA-CR-172381] N84-32119
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83760] N84-32122
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123
Annoyance caused by propeller airplane flyover noise
[NASA-TP-2356] N84-32124

AIRCRAFT PERFORMANCE
Extensions and modifications to the ARL point-performance program
[AD-A142078] N84-31113

AIRCRAFT SAFETY
Simulated crash decelerations in a light aircraft cabin
[AD-A142806] N84-31102

AIRCRAFT SPECIFICATIONS
Managing aircraft/simulator concurrency
[AD-P003483] N84-32240

AIRCRAFT STRUCTURES
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117

AIRFOILS
Stall delay by boundary layer blowing and/or suction
N84-31086
Feedback in separated flows over symmetric airfoils
[NASA-TM-83758] N84-31091
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85966] N84-31092
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85963] N84-31094
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31096
Wing design for minimum drag with practical constraints N84-31109
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554
Flux-vector splitting and Runge-Kutta methods for the Euler equations
[NASA-CR-172415] N84-31993
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018

AIRFRAME MATERIALS
Composite structure repair
[AD-A141456] N84-31300

AIRFRAMES
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848

AIRPORT SECURITY
Missile system for low altitude air defence
N84-31255

AIRPORTS
Multi-variate acceptance plans for flexible airport pavements N84-31220
Missile system for low altitude air defence
N84-31255

AIRSPACE
National Airspace Review: Implementation plan
N84-31107

ALASKA
Surface winds in some Alaskan passes
[PB84-194745] N84-31895

ALBEDO
Observations of radiation exchange above and below Amazonian forest
[INPE-3194-PRE/558] N84-31870

ALCOHOLS
Research and development of alcohol fuel usage in spark ignited engines
[DE84-011177] N84-31412

ALDOSTERONE
Age-related responses to de- and hyperhydration
N84-31905

ALGORITHMS
Stall delay by boundary layer blowing and/or suction
N84-31086
An on-line equivalent system identification scheme for adaptive control N84-31213
Attitude dynamics of the Galileo spacecraft
N84-31262
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Exponential-fitted methods for integrating stiff systems of ordinary differential equations: Applications to homogeneous gas-phase chemical kinetics N84-31279
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
N84-31280
A comparative study of linear array synthesis technique using a personal computer
[AD-P003500] N84-31488
Multiple source DF (Direction Finding) signal processing: An experimental system
[AD-P003515] N84-31493
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31498
The new algorithm for symbolic network analysis
N84-31509
Princeton VLSI project
[AD-A142959] N84-31521
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
Self-adaptive solution strategies N84-31693

Enhanced Fourier algorithms for ultrasonic crack characterization
[DE84-012544] N84-31714
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802
Abstraction, specification and implementation techniques with an application to garbage collection — data processing
[MATH-CENTRE-TRACTS-166] N84-31980
A model of asynchronous iterative algorithms for solving large, sparse, linear systems
[NASA-CR-172418] N84-31988
Fundamental research in applied mathematics
[AD-A143123] N84-32016
PLTMGC: A multi-grid continuation program for parameterized nonlinear elliptic systems
[DE84-010406] N84-32017
Algorithm for secondary electron emission from water vapor by high velocity ions
[DE84-011671] N84-32142
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT
[AD-A142788] N84-32267
Logical optimization for database uniformization
[NASA-CR-173836] N84-32282

ALIGNMENT
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
Feed error effects on lens performance
[AD-P003513] N84-31481
Operational performance of the Antares alignment system
[DE84-012650] N84-31632

ALKENES
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404

ALKYL COMPOUNDS
CO2 laser decomposition of the alkyl phosphites N84-31402
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404

ALLOCATIONS
Equitable assignment rules
[AD-A142809] N84-32268

ALLUVIUM
Mathmetical modeling of longitudinal profile adjustment in alluvial streams N84-31726

ALTERNATING CURRENT
Alternating acoutoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449
AC propulsion system for an electric vehicle, phase 2
[NASA-CR-168244] N84-31514
Magnetic impurity scattering in in situ superconductors
[DE84-012835] N84-32212

ALTITUDE SIMULATION
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273

ALUMINUM
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading
[NASA-CR-3815] N84-31290
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83736] N84-31344
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31708

ALUMINUM ALLOYS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352
The effects of deformation mode and microstructure fracture-related properties of Ti alloys
[AD-A142891] N84-31353
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure
[DE84-012395] N84-31361
Deposits on light alloys — aluminum
[CETIM-12-F-380] N84-31371
Investigation of in position end to end welding of an aluminum alloy by electron beam
[CETIM-12-Y-442] N84-31652
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790

ALUMINUM CHLORIDES
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013066] N84-31328

ALUMINUM OXIDES
Transport behavior of multivalent beta aluminas
[AD-A142968] N84-31382
Nd-3+ Beta prime prime alumina platelet laser
[AD-A142797] N84-31621
In-situ TEM investigations of graphic-epitaxy and small particles
[NASA-CR-166593] N84-32201

AMAZON REGION (SOUTH AMERICA)
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
Observations of radiation exchange above and below Amazonian forest
[INPE-3194-PRE/558] N84-31870

AMBIENCE
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302

AMBIPOLAR DIFFUSION
Azimuthal electric fields and tandem ambipolarity
[DE84-010843] N84-32189

AMIDES
Lithium cell reactions
[AD-A142976] N84-31522

AMMONIA
Method of making fine-grained triaminotrinitrobenzene
[DE84-012754] N84-31413
Urban and local source effects on precipitation chemistry
[DE84-011848] N84-31803

AMORPHOUS MATERIALS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Improvement in quality of silicon-based amorphous films N84-32041

AMPLIFICATION
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142966] N84-31622

AMPLIFIER DESIGN
Development of a transimpedance amplifier for cryotemperatures, study --- high sensitivity infrared detectors
[BMFT-FB-W-84-023] N84-31610

AMPLITUDE MODULATION
Microwave phase modulators using semiconductor diodes (survey) N84-31448

AMPLITUDES
Hoop/column antenna: RF verification model. Volume 1: Test results
[NASA-CR-172412] N84-31463
The use of overlapped subarray techniques in simultaneous receive beam linear arrays
[AD-P003501] N84-31469
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047

ANALOG DATA
A multi-GHz multi-channel photonic analog data processing system
[DE84-012281] N84-32175

ANALOGIES
The copycat project: An experiment in nondeterminism and creative analogies
[AD-A142744] N84-31990

ANALOGS
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494

ANALYSIS (MATHEMATICS)
Research in nonlinear motion
[AD-A143000] N84-32013

ANALYSIS OF VARIANCE
Variance-stable R-estimators
[AD-A143172] N84-32024

ANALYZING
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470

ANDESITE
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential
[DE84-012404] N84-31552

ANEMOMETERS
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875

ANGLES (GEOMETRY)
Conformal array analysis
[AD-P003504] N84-31472
Axial-conductances angular filter investigation
[AD-A142802] N84-31487

ANGULAR RESOLUTION
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321

ANGULAR VELOCITY
Psychophysics of proprioceptive sensibility N84-31933

ANHYDRIDES
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

ANISOTROPIC MEDIA
A shear deformable shell element for laminated composites N84-31691

ANISOTROPY
Properties of bubble domains in cholesteric-nematic mixtures N84-32039

ANNEALING
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites
[NASA-CR-173870] N84-31289
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519

ANNUAL VARIATIONS
Comparative study of heat pump regulation systems. The problem of defrosting evaporators
[CETIM-100250] N84-31589
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases
[NASA-TM-86096] N84-31761
Variability in the height distribution of electrojet currents of Jicamarca
[INPE-3205-PRE/563] N84-31840
Comparison between density profiles obtained at Cachoeira Paulista, Brazil, and deduced from IRI-79 model
[INPE-3136-PRE/527] N84-31843
Interannual variations of rainfall in northeast Brazil and their connections with the large-scale features
[INPE-3207-PRE/565] N84-31868

ANODES
The effect of current density on anode depolarization economics
[DE84-010465] N84-31524
A review of anode phenomena in vacuum arcs
[DE84-012371] N84-31547

ANODIC COATINGS
Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue
[DE84-012911] N84-31367

ANOMALIES
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil
[INPE-3214-PRE/567] N84-31867
Proceedings of the 8th Annual Climate Diagnostics Workshop
[PB84-192416] N84-31893
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336

ANTENNA ARRAYS
Adaptive multibeam antenna array N84-31430
Design of short-wave absorption lines N84-31433
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471

Conformal array analysis
[AD-P003504] N84-31472
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
Wideband microstrip ring radiator
[AD-P003507] N84-31475
Moebius r-2R lens
[AD-P003511] N84-31479
Multiple source DF (Direction Finding) signal processing: An experimental system
[AD-P003515] N84-31483
Solution of some additional electromagnetic problems by the discrete convolution method
[AD-A143056] N84-31493
The behavior of very large short pulse antennas
[DE84-012372] N84-31500
Effect of spatial decorrelation on nulling performance of linear adaptive array
[AD-A143013] N84-31570

ANTENNA DESIGN
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
Adaptive antennas for tropospheric radio relay lines N84-31432
Phase light range finder N84-31447
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
Broadband microstrip matching techniques
[AD-P003506] N84-31474
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476
Moebius r-2R lens
[AD-P003511] N84-31479

ANTENNA FEEDS
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470
Feed error effects on lens performance
[AD-P003513] N84-31481

ANTENNA RADIATION PATTERNS
Hoop/column antenna RF verification model. Volume 2: Analysis and correlation
[NASA-CR-172413] N84-31462
Hoop/column antenna: RF verification model. Volume 1: Test results
[NASA-CR-172412] N84-31463
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
A dual-ported, dual-polarized spherical near-field probe
[AD-P003514] N84-31482
Antenna pattern characteristics of fine-steered pencil beams
[AD-P003516] N84-31484
Solution of some additional electromagnetic problems by the discrete convolution method
[AD-A143056] N84-31493

ANTENNAS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
Adaptive antennas for tropospheric radio relay lines N84-31432
On the quasi-periodic microstrip snake antenna with metal trough backing
[AD-P003510] N84-31478
Using information on tangential target motion in space-time signal processing N84-32101

ANTHROPOMETRY
Anthropometric and mass distribution characteristics of the adult female, revised
[AD-A143096] N84-31939

ANTIMISSILE MISSILES
A new concept for guiding missiles with an application to the ground-air system N84-31253

ANTIMISTING FUELS
Characterization and degradation studies on synthetic polymers for aerospace application
[NASA-CR-166597] N84-31284

ANTIREFLECTION COATINGS
Recent damage results for antireflection coatings at 355 NM
[DE84-011560] N84-31388

ANVIL CLOUDS
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31866

APERTURES
Synthesis of offset dual shaped subreflector antennas for control of Cassegrain aperture distributions
[AD-P003517] N84-31485
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491

APPROXIMATION
Optimal low-thrust transfers to geosynchronous orbit N84-31240
On the controlled approximation order from certain spaces of smooth bivariate splines
[AD-A142868] N84-32004
Spline approximation for retarded systems and the Riccati equation
[AD-A142963] N84-32010
Acoustic propagation in a termally stratfied atmosphere
[NASA-CR-173863] N84-32121
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32163

AQUIFERS
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31728

ARC WELDING
Instrumentation for real-time ultrasonic sensing of arc welding characteristics
[DE84-012536] N84-31649
Real-time ultrasonic sensing of arc welding processes
[DE84-005031] N84-31657

ARCHES
Double arch mirror study. Part 1: Preliminary engineering report
[NASA-CR-166589-PT-1] N84-31634

ARCHITECTURE (COMPUTERS)
The NEBULA and MCF (Military Computer Family) standardization programs
[AD-P003531] N84-31135
The NEBULA standard computer architecture
[AD-P003532] N84-31136
Transportability of NEBULA software
[AD-P003533] N84-31137
A common 1553B I/O channel for the F-16
[AD-P003546] N84-31150
MIL-STD-1750A users group
[AD-P003547] N84-31151
A high performance MIL-STD-1750A microprocessor
[AD-P003549] N84-31153
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155
The use of computer ISA (Instruction Set Architectures) and software standards at Westinghouse Defense Electronics Center
[AD-P003552] N84-31156
Transportable GPU (General Processor Units) chip set technology for standard computer architectures
[AD-P003553] N84-31157
MIL-STD-1750A verification testing
[AD-P003555] N84-31159
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166
Standard ISAs (Instruction Set Architectures) and VLSI (Very Large Scale Integration): Two interacting trends
[AD-P003563] N84-31168
PAVE PILLAR: A maturation process for an advanced avionics architecture
[AD-P003568] N84-31173
Advanced cockpit-systems integration
[AD-P003569] N84-31174
Defense industry attitudes about AF interface standards report of an electronics industries association survey
[AD-P003570] N84-31175
A general purpose computer architecture investigation facility
[AD-P003573] N84-31178
Architecture, hardware and software issues in fielding the next generation DOD processors
[AD-P003581] N84-31186
Quantum leap in avionics
[AD-P003584] N84-31189
Architectural and control considerations for a high speed signal processor implemented with an Ada (Trademark) executive
[AD-P003594] N84-31199
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
Thinking big
[DE84-007412] N84-31951
Software design issues in the implementation of hierarchical display editors N84-31953
Guidelines for testing and release procedures
[NASA-CR-166581] N84-31982
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973

ARCTIC REGIONS
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
Geology and geochemistry of the Arctic prospect, Ambler District, Alaska N84-31814

ARGON LASERS
Experiments in development of powerful dye laser N84-32095

ARITHMETIC
The arithmetic of differentiation
[AD-A142964] N84-32011

ARIZONA
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776

ARM (ANATOMY)
Psychophysics of proprioceptive sensibility N84-31933

ARMED FORCES (UNITED STATES)
Westinghouse uses USAF-developed standards
[AD-P003572] N84-31177
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230
Marine Corps ground simulator training needs in the 1985-1995 time frame
[AD-P003465] N84-32242
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266

ARRAYS
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
Deep-Towed Array Geophysical System (DTAGS): A hardware description
[AD-A142970] N84-31851

ARTERIES
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58262] N84-31935

ARTIFICIAL INTELLIGENCE
Computational aerodynamics and artificial intelligence
[NASA-TM-85994] N84-31089
Potential application of artificial concepts to aerodynamic simulation
[NASA-TM-85978] N84-31093
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
Intelligent instruments for process measurement techniques (monitoring of sensors)
[BMFT-FB-T-84-078] N84-31611
Basis research on intelligent robotic systems operating in hostile environments: New developments at ORNL
[DE84-011464] N84-31647
Applying artificial intelligence to large networks N84-31743
Knowledge-based expert systems for crop identification N84-31744
Knowledge based engineering for spatial database management and use N84-31745
The potential of AI techniques for remote sensing N84-31748
The copycat project: An experiment in nondeterminism and creative analogies
[AD-A142744] N84-31990

ASPECT RATIO
Nonlinear finite element analysis of shells with large aspect ratio N84-31692

ASPHALT
Multi-variate acceptance plans for flexible airport pavements N84-31220

ASSEMBLY LANGUAGE
Object code optimization in a standard compiler
[AD-P000820] N84-31124
ASSESSMENTS
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P003588] N84-31193
Regional Wind Energy Assessment Program report. Appendix: Wind statistics summaries
[DE84-011835] N84-31876
ASTEROIDS
Asteroid light inversion
[NASA-CR-173884] N84-32316
ASTRONOMICAL MODELS
Theoretical models for the polarization of astronomical masers N84-32313
Theoretical study of cepheid light curves
[DE84-012453] N84-32322
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326
Three-dimensional model for fusion processes
[DE84-011731] N84-32339
ASTRONOMICAL OBSERVATORIES
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
Studies of low-mass star formation with the large deployable reflector
[NAJA-TM-85980] N84-32328
ASTRONOMICAL TELESCOPES
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85980] N84-32328
ASTROPHYSICS
Results from Astron satellite after one year in orbit N84-31233
ASYMPTOTIC METHODS
Hopf bifurcation in two-component flow
[AD-A142844] N84-31566
Asymptotic estimates for resolvents of some nonintegrable Volterra kernels
[AD-A141682] N84-31999
Variance-stable R-estimators
[AD-A143172] N84-32024
ASYMPTOTIC SERIES
Fundamental research in applied mathematics
[AD-A143123] N84-32016
Nonnegative matrices in dynamic programming
[MATH-CENTRE-TRACTS-167] N84-32026
ATHLETES
Psychophysics of proprioceptive sensibility N84-31933
ATLANTIC OCEAN
Microfacies, depositional environments and diagenesis of the Amapa carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
South Atlantic physical oceanography study (year 5). Volume 1: Executive summary
[PB84-167855] N84-31899
ATMOSPHERIC BOUNDARY LAYER
Research study: Organization and development of organized convection in the boundary layer
[NASA-CR-171115] N84-31552
ATMOSPHERIC CHEMISTRY
Temperature oscillations and ozone correlations in the lower stratosphere of Natal (6 deg S)
[INPE-3116-PRE/512] N84-31844
Studies in atmospheric chemistry. Part 1: Primary peroxides from hydrocarbons. Part 2: elemental analysis using nuclear reactions
[DE84-012246] N84-31857
ATMOSPHERIC CIRCULATION
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732
Three-dimensional computer model for the atmospheric general circulation experiment
[NASA-CR-171109] N84-31883
Proceedings of the 8th Annual Climate Diagnostics Workshop
[PB84-192418] N84-31893
Discussion of the Ionian and Levantine Seas
[DE84-011582] N84-31898
An ocean climate research strategy
[PB84-194826] N84-31902
ATMOSPHERIC COMPOSITION
A modified standard method for the determination of ozone residual concentration by spectrophotometry
[PB84-204884] N84-31335
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459
US EPA (Environmental Protection Agency) regional oxidant model, background and overview
[PB84-201680] N84-31606
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31647
Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction
[DE84-012079] N84-31679
CO2 forecasting and control: A mathematical approach
[DE84-013454] N84-31682
Geophysical monitoring for climatic change Number 11,
[PB84-181841] N84-31683
ATMOSPHERIC ELECTRICITY
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597
ATMOSPHERIC MODELS
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases
[NASA-TM-86096] N84-31761
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31807
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171117] N84-31835
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171116] N84-31836
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171127] N84-31837
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31846
AFGL cloud modeling program: Annex
[AD-A143084] N84-31872
Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction
[DE84-012079] N84-31879
Extending normal mode initialization: A new method
[PB84-196435] N84-31885
A computer calculation and display station for slosh hurricane surge model data
[PB84-196753] N84-31887
ATMOSPHERIC PHYSICS
Environmental Research Laboratories publication abstracts, FY 1983
[PB84-189323] N84-31892
ATMOSPHERIC RADIATION
Dynamic characteristic of intense short microwave propagation in an atmosphere
[DE84-002788] N84-31496
ATMOSPHERIC SCATTERING
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459
ATMOSPHERIC TEMPERATURE
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31866
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
Proceedings of the 8th Annual Climate Diagnostics Workshop
[PB84-192418] N84-31893
ATMOSPHERIC TURBULENCE
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111
ATOMIC BEAMS
Optically pumped polarized alkali atomic beams and targets
[DE84-012369] N84-32147
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195
ATOMIC EXCITATIONS
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31763
ATOMS
Triply differential studies of atomic and molecular photoionization using synchrotron radiation
[AD-A142834] N84-32133
ATTENUATION
Protective plasma envelope
[DE84-013316] N84-32194
ATTENUATION COEFFICIENTS
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173848] N84-32115
Measurement of multimode optical fiber attenuation: An NBS special test service
[PB84-192202] N84-32179
ATTITUDE CONTROL
Attitude determination using strapdown inertial sensors and adaptive estimation
[INPE-3180-PRE/545] N84-31106
Helium thruster propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
Attitude dynamics of the Galileo spacecraft N84-31262
AUDITORY DEFECTS
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Noise as a public health problem, volume 2
[AD-A142413] N84-31800
AUDITORY SIGNALS
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
AUDITORY STIMULI
The discrimination of pitch in pulse trains and speech
[AD-A142996] N84-32127
AUGMENTATION
Numerical solution of viscoplastic flow problems by augmented lagrangians
[AD-A142793] N84-31606
AUTOCLAVES
Study of the kinetics of hydrogenation using aged catalysis
[DE84-006588] N84-31330
AUTOIONIZATION
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
AUTOMATIC CONTROL
Architectural and control considerations for a high speed signal processor implemented with an Ada (Trademark) executive
[AD-P003584] N84-31199
Automated Construction Management System (ACMS). Volume 1: User's guide
[AD-A143031] N84-31971
Automatic audit information system for software development
[AD-P003499] N84-32265
Special features of information presentation in teaching systems
[BLL-M-95804-(5828.4)] N84-32273
AUTOMATIC FLIGHT CONTROL
Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112
Feasibility study of a low cost Energy Performance Management System (EPMS) — automatic flight control
[BMFT-FB-W-84-015] N84-31116
AUTOMATIC TEST EQUIPMENT
MATE standardization
[AD-P003587] N84-31192
AUTOMATION
Automation of a drop forge at the Centre Techniques des Industries Mecaniques (CETIM) forge section
[CETIM-1.3K.27.3] N84-31423
AUTOMOBILE ENGINES
Automotive Stirling engine development program
[NASA-CR-174822] N84-32305

AUTOMOBILES
Cost effectiveness of converting to alternative motor vehicle fuels. A technical assistance study for the city of Longview
[DE84-010479] N84-31415
Producer gas: Another fuel for motor transport
[DE84-901068] N84-31416
AUTOMORPHISMS
On the uniqueness of a regular thin near octagon on 288 vertices (or the semiblplane belonging to the Mathieu group M12)
[MC-ZW-196/83] N84-32029
AVAILABILITY
Wind energy: a brief assessment
[DE84-012208] N84-31788
AVALANCHES
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
AVIONICS
Software modifications to the Demonstration Advanced Avionics Systems (DAAS)
[NASA-TM-85942] N84-31105
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 1
[AD-A142776] N84-31121
Management overview of the benefits of efficient JOVIAL J73/1750A software tools
[AD-P003519] N84-31123
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software
[AD-P003524] N84-31128
Consideration of MIL-STD-1760, aircraft/store electrical interface standard on stores management system architectures
[AD-P003529] N84-31133
Aircraft multiplexing system architecture and stores compatibility
[AD-P003530] N84-31134
MIL-STD-1553B Marconi LSI chip set in a remote terminal application
[AD-P003538] N84-31142
A common 1553B I/O channel for the F-16
[AD-P003546] N84-31150
MIL-STD-1750A microprocessor chip set development
[AD-P003548] N84-31152
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 2
[AD-A142777] N84-31165
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166
Achieving the benefits of modular avionics design
[AD-P003562] N84-31167
Navy packaging standardization thrusts
[AD-P003564] N84-31169
An introduction to the avionics integrity program
[AD-P003565] N84-31170
Elements for successful implementation of computing standards
[AD-P003566] N84-31171
The application of standards to the TDY-750 (TIGERSHARK) mission computer
[AD-P003567] N84-31172
PAVE PILLAR: A maturation process for an advanced avionics architecture
[AD-P003568] N84-31173
Advanced cockpit-systems integration
[AD-P003569] N84-31174
Defense industry attitudes about AF interface standards report of an electronics industries association survey
[AD-P003570] N84-31175
Digital avionics design for validation
[AD-P003571] N84-31176
Concepts for LHX avionics
[AD-P003575] N84-31180
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003577] N84-31182
Proposed MIL-STD for avionics installation interfaces
[AD-P003578] N84-31183
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185
Standard avionics software: The future strategy for cost-effective avionics
[AD-P003582] N84-31187
Quantum leap in avionics
[AD-P003584] N84-31189
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[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
On-line task analyses in maintenance simulation
[AD-P003452] N84-32229
AXIAL FLOW
Blade endwall flows in an axial flow compressor stage
N84-31209
AXIAL FLOW TURBINES
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
AXIAL LOADS
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31686
AXISYMMETRIC BODIES
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090
Another look at the use of complex sources for the generation of bodies of revolution in incompressible flow
[CAR-8412] N84-31555
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32068
AXONS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Nonlinear dynamics in excitable nerve membranes
N84-32037

B

BACKSCATTERING
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171130] N84-31459
Double scattering background in a CW lidar
N84-32072
BANACH SPACE
State estimation and parameter identification: An approach involving a pair consisting of the initial state and the trajectory
[INPE-3183-PRE/548] N84-31995
BANDPASS FILTERS
Dielectric-grating band-pass filters N84-31442
Discrimination of iron alteration minerals in remote sensing data N84-31727
BANDWIDTH
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476
BARIUM TITANATES
Preliminary experiments on phase conjugation for flow visualization — barium titanate single crystals
[NASA-TM-83766] N84-32169
BAROCLINIC INSTABILITY
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31848
BAROTROPIC FLOW
On the stability of boundary-induced flows and modons
[PREPRINT-372] N84-31591
BASALT
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[E84-10186] N84-31760
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential
[DE84-012404] N84-31852
BATCH PROCESSING
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997
BATHOLITHS
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828
BATTERY CHARGERS
Test and evaluation of the Philips Model PE 1701 and Lester Model 9965 electric vehicle battery chargers
[DE84-901243] N84-31541
BAYES THEOREM
Statistical tests for detecting crustal movements using Bayesian inference
[PB84-196811] N84-31861
Bayesian models for response surfaces, 2: Estimating the response surface
[AD-A142788] N84-32001
Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines
[AD-A142843] N84-32003
BEAM INJECTION
Design fabrication and testing of the BNL radio frequency quadrupole accelerator
[DE84-011915] N84-32145
Pulsed high-current source of negatively charged hydrogen ions
[DE84-012989] N84-32158
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
High power neutral beam heating on Doublet 3
[DE84-012471] N84-32186
Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-008955] N84-32191
BEAM INTERACTIONS
Using ions to probe the transverse size of a bunch
[DE84-012772] N84-32141
Future accelerators using micro-fabrication technology
[DE84-002692] N84-32157
BEAM RIDER GUIDANCE
Some aspects of guidance loop design for SAM systems N84-31251
BEAMS (RADIATION)
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
The use of overlapped subarray techniques in simultaneous receive beam linear arrays
[AD-P003501] N84-31469
Antenna pattern characteristics of fine-steered pencil beams
[AD-P003518] N84-31484
Short wavelength optics for future free electron lasers
[DE84-012316] N84-31626
BEAMS (SUPPORTS)
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31666
Combined experimental/analytical modeling using component mode synthesis
[DE84-013147] N84-31715
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974
BED REST
Pharmacologic counter measures minimizing post-space flight orthostatic intolerance — bed rest, drug disposition, and physiological function
[NASA-CR-173861] N84-31936
BEHAVIOR
Transport behavior of multivalent beta aluminas
[AD-A142968] N84-31382
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-012] N84-31916
BENARD CELLS
A selection principle in Benard-type convection
[NASA-CR-173869] N84-31559

BETATRONS
Longitudinal and transverse instabilities in a high current modified betatron electron accelerator [AD-A142882] N84-32132
BIBLIOGRAPHIES
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A comprehensive guide to the literature on acoustic emission from composites [DE84-011084] N84-31296
Surface modification and coatings: A technical assessment [DE84-012483] N84-31396
Splash and spray from road vehicles and associated topics: A bibliography [CAR-8426] N84-31557
Earth resources, a continuing bibliography with indexes [NASA-SP-7041(42)] N84-31725
Annotated bibliography of global resources information systems related publications N84-31746
Global resources information system N84-31747
NASA patent abstracts bibliography, a continuing bibliography. Section 1: Abstracts (Supplement 25) [NASA-SP-7039(25)-SECT-1] N84-32272
Microgravity Science Applications Bibliography: 1984 revision [NASA-TM-86651] N84-32283
Selected bibliography of solar thermal literature. Volume 2: Indexes [DE84-009363] N84-32286
Publications of the Executive Office of the President, January 20, 1981 - March 31, 1984 [PB84-162326] N84-32296
BINARY DATA
Efficient sequential designs with binary data [AD-A142904] N84-32008
BINARY DIGITS
Efficient sequential designs with binary data [AD-A142904] N84-32008
BINARY SYSTEMS (MATERIALS)
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590
BIOCHEMISTRY
European scientific notes, volume 38, no. 5 [AD-A141713] N84-32285
BIODYNAMICS
Study of spatial asymmetry in human external electrical field N84-31932
BIOENGINEERING
Conference Grant for 2nd World Congress on Biomaterials [AD-A143129] N84-31915
BIOFEEDBACK
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31927
BIOLOGICAL EFFECTS
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922
BIOLOGICAL EVOLUTION
Galactic cycles and their relationship to life on Earth [DE84-011737] N84-32329
BIOLOGICAL MODELS (MATHEMATICS)
Sensitivity to hypoxia in humans N84-31934
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
BIOLOGY
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-USB-84-012] N84-31916
BIOMASS
Habitability of the Earth N84-31740
NASA pilot land data system N84-31741
BIOMEDICAL DATA
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
Medical research in first 100 days of Salyut-7 flight N84-31230
BIPOLAR TRANSISTORS
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510
BIPOLARITY
Circuit engineering principles for construction of bipolar large-scale integrated circuit storage devices and very large-scale main memory N84-31441
Study of bipolar batteries [DE84-013193] N84-31540
BIREFRINGENCE
Newly discovered effect of interaction of optical radiation and glass N84-32069
BIVARIATE ANALYSIS
On the controlled approximation order from certain spaces of smooth bivariate splines [AD-A142868] N84-32004
Convergence of bivariate cardinal interpolation [AD-A142894] N84-32006
BLACK BODY RADIATION
A blackbody-pumped CO2-N2 transfer laser [NASA-TP-2347] N84-31617
BLOOD CIRCULATION
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
BLOOD PRESSURE
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930
BLOWING
Stall delay by boundary layer blowing and/or suction N84-31086
BODIES OF REVOLUTION
Another look at the use of complex sources for the generation of bodies of revolution in incompressible flow [CAR-8412] N84-31555
BODY SIZE (BIOLOGY)
Anthropometric and mass distribution characteristics of the adult female, revised [AD-A143096] N84-31939
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990 [AD-A142948] N84-31948
BODY TEMPERATURE
Effect of body temperature on human work capacity N84-31926
BOEING 737 AIRCRAFT
Flight service evaluation of two aluminum-brazed titanium spoilers [NASA-CR-172371] N84-31343
BOILING
Ammonia boiling in long tubes. Heat transfer and charge loss in vertical and horizontal tubes [CETIM-14-C-011] N84-31588
BOLTS
Hydrogen fatigue test — plated bolts [CETIM-12-F-400] N84-31373
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element [NASA-TM-86456] N84-31639
BONDING
Composite structure repair [AD-A141456] N84-31300
BOOLEAN ALGEBRA
Economical multiplication of Boolean equations N84-32079
BOOM
Measurement of turbulent wind velocities using a rotating boom apparatus [DE84-012417] N84-31675
BOOMS (EQUIPMENT)
Optimization of the capture process for a rigid satellite stabilized by gravity gradient [INPE-3164-PRE/549] N84-31245
BOREHOLES
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean [AD-A142873] N84-31650
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California [DE84-009591] N84-32165
BORON
Environment and fracture [DE84-011454] N84-31360
Studies of hydrogenated amorphous silicon [DE84-011888] N84-32211
BORON NITRIDES
Turning of hardened ferrous materials with homogeneous CBN tool tips [CSIR-TRANS-1728] N84-31418
Grinding with Borazon: Progress and rewards [CSIR-TRANS-1718] N84-31420
Internal grinding of high-speed steels: Shorter processing times with boron nitride grinding tools [CSIR-TRANS-1719] N84-31421
BORON REINFORCED MATERIALS
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading [NASA-CR-3815] N84-31290
BOSONS
Electroweak interaction parameters [DE84-012910] N84-32159
BOUNDARIES
Geology of the Gualan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
Research in nonlinear motion [AD-A143000] N84-32013
BOUNDARY ELEMENT METHOD
Nonlinear Structural Analysis [NASA-CP-2397] N84-31698
Three-dimensional stress analysis using the boundary element method N84-31700
BOUNDARY LAYER EQUATIONS
Stall delay by boundary layer blowing and/or suction N84-31086
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations [AD-A141634] N84-31564
BOUNDARY LAYER FLOW
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations [AD-A141634] N84-31564
On the stability of boundary-induced flows and modons [PREPRINT-372] N84-31581
Flow structures and their evolution in turbulent shear layer N84-32091
BOUNDARY LAYER TRANSITION
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations [AD-A141634] N84-31564
BOUNDARY LAYERS
Flow in a tapered centrifuge [DE84-012553] N84-31573
Pressure effects on wall heat transfer during flame quenching [DE84-012265] N84-31575
Two-dimensional vapor flow analysis in heat pipes [DE84-012581] N84-31582
Coefficient of surface friction with turbulent flow in boundary layer N84-32084
Graduate engineering research participation in aeronautics [NASA-CR-173849] N84-32220
BOUNDARY LUBRICATION
Lubrication of machine elements [NASA-RP-1126] N84-31640
BOUNDARY VALUE PROBLEMS
Calculation of boundary layers of oscillating airfoils [NASA-TM-85943] N84-31554
Global solutions for the one-dimensional equations of a viscous reactive gas [AD-A142931] N84-31569
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading [NASA-TM-86271] N84-31686
BOW WAVES
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation [NASA-TM-86131] N84-32333
BOWS
Suprathermal ions upstream of the Earth's bow shock [DE84-012625] N84-31655
BRAGG ANGLE
Investigation of Bragg reflection of electromagnetic surface waves by diffraction grating N84-32053
BRAIN
Psychophysiological aspects of monotonous human activity N84-31911
BRAKES (FOR ARRESTING MOTION)
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
BRANCHING (MATHEMATICS)
Transition bifurcation branches in non-linear water waves [CAR-8418] N84-31556
Hopf bifurcation in two-component flow [AD-A142844] N84-31568
BRASSES
Crack initiation model for stress corrosion cracking alpha-brass [DE84-012637] N84-31712
BRAYTON CYCLE
Waste heat recovery from adiabatic diesel engines by exhaust-driven Brayton cycles [NASA-CR-168257] N84-32307
BRAZIL
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting [E84-10176] N84-31736
Two years experience testing solar collectors in Brazil [INPE-3221-RPE/461] N84-31785
Microfacies, depositional environments and diagenesis of the Amapa carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817

Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827

Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil [INPE-3039-PRE/469] N84-31839

Comparison between density profiles obtained at Cachoeira Paulista, Brazil, and deduced from IRI-79 model [INPE-3138-PRE/527] N84-31843

Observations of radiation exchange above and below Amazonian forest [INPE-3194-PRE/558] N84-31870

BRAZILIAN SPACE PROGRAM

An adaptive attitude controller for terrestrial artificial satellites [INPE-3188-PRE/561] N84-31243

Pitch control of a satellite using stabilizing flaps [INPE-3185-PRE/560] N84-31246

BRESEX: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface [NASA-CR-173673] N84-31271

BRAZING

Sodium compatibility of refractory metal alloy/304L braze joints [DE84-012877] N84-31364

BREMSSTRAHLUNG

Bremsstrahlung from longitudinal plasma waves produced by subthermal electrons in plasma N84-32102

BRIDGMAN METHOD

Mathematical model for a simplified Bridgman-Stockbarger crystal growing system [NASA-CR-171106] N84-32202

BRITTLENESS

Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340

BROADBAND

Broadband microstrip matching techniques [AD-P003606] N84-31474

BROADCASTING

USSR report: Electronics and electrical engineering [JPRS-UEE-84-008] N84-31427

The acoustic design of outside broadcast vehicles [BBC-RD-1984/3] N84-31454

Selected worldwide marine weather broadcasts [PB84-192855] N84-31894

BROMIDES

Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404

BRONCHI

Modulation of the cholinergic mechanisms in the bronchial smooth muscle [NDRE/PUBL-84-1001] N84-31937

BUBBLES

Mie scattering as a technique for the sizing of air bubbles [AD-A142737] N84-32170

BUCKLING

The effect of finite rotation on a problem in plastic deformation [DE84-012827] N84-31710

BUDGETING

An evaluation of the system 2000 data base management system for use in major item system mapping [DE84-013130] N84-32296

BURNING RATE

Wall quench and flammability limit effects on exhaust hydrocarbon emission [DE84-009754] N84-31307

BUS CONDUCTORS

A programmable bus control interface [AD-P003536] N84-31140

Single chip MIL-STD-1553B bus interface unit keeps pace with chip sets [AD-P003537] N84-31141

Application of 1553B to MRASM (Medium Range Air to Surface Missile): A systems look [AD-P003540] N84-31144

MIL-STD-1553B in MRASM (Medium Range Air to Surface Missile): The designer's challenge [AD-P003541] N84-31145

C

CALCIUM

Urban and local source effects on precipitation chemistry [DE84-011848] N84-31803

CALIBRATING

Results of the first complete static calibration of the RSRA rotor-load-measurement system [NASA-TP-2327] N84-31111

Calibration of CT-4A fatigue test article, March 1983 [AD-A142880] N84-31115

Development of long-length wire filament strain gages [DE84-011543] N84-31805

Thermocouple simulation: A calibration technique [DE84-012408] N84-31806

Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper [E84-10056] N84-31731

LANDSAT 4 band 6 data evaluation [E84-10175] N84-31737

TM digital image products for applications — computer compatible tapes [E84-10176] N84-31749

Relative radiometric calibration of LANDSAT TM reflective bands [E84-10179] N84-31750

Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper [E84-10180] N84-31751

Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper [E84-10181] N84-31752

Characterization of radiometric calibration of LANDSAT-4 TM reflective bands [E84-10182] N84-31753

CALIFORNIA

Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819

Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831

CALORIMETERS

Opacification of high temperature fibrous insulation [NASA-CR-166578] N84-31295

Differential scanning calorimeter data acquisition system [AD-A143118] N84-31600

CAMERAS

Automatic camera tracking for remote manipulators [DE84-011455] N84-31808

CANONICAL FORMS

Two-phase methods of solving canonical problem of linear programming N84-32078

CANOPIES (VEGETATION)

Daily variations of temperature and humidity within and above Amazonian forest [INPE-3196-PRE/560] N84-31869

CAPACITANCE

Automatic digital battery cell capacitance measurements [AD-A143143] N84-31523

CAPACITORS

Properties of polymers: Some uses in electronics, part two [DE84-012864] N84-31387

Energy storage capacitors. Lecture 4: Appendix [DE84-010040] N84-31546

CAPILLARY FLOW

Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components [AD-A143028] N84-32205

CARBON

Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites [SNIAS-841-551-102] N84-31296

Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405

Dual ion beam deposition of carbon films with diamondlike properties [NASA-TM-83743] N84-31512

Atomic carbon in the Venus thermosphere: Observations and theory N84-32332

CARBON CYCLE

Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction [DE84-012079] N84-31879

CARBON DIOXIDE

Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes [PB84-214360] N84-31334

Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization [DE84-011895] N84-31874

Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction [DE84-012079] N84-31879

Inventory of numeric data for carbon dioxide research, revision 1 [DE84-013683] N84-31881

CARBON DIOXIDE CONCENTRATION

Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction [DE84-012079] N84-31879

CO2 forecasting and control: A mathematical approach [DE84-013454] N84-31882

Geophysical monitoring for climatic change Number 11, [PB84-181841] N84-31883

CARBON DIOXIDE LASERS

A blackbody-pumped CO2-N2 transfer laser [NASA-TP-2347] N84-31617

Operational performance of the Antares alignment system [DE84-012889] N84-31832

Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32085

Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094

Waveguide CO2 laser with 7.5 W power rating N84-32099

CARBON FIBER REINFORCED PLASTICS

Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites [NASA-CR-173870] N84-31289

The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292

CARBON MONOXIDE

Crystallite size and support effects on CO hydrogenation reactions [DE84-012474] N84-31314

Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy [DE84-009246] N84-31327

CARBONATES

Molten carbonate fuel cell cathode development [DE84-012101] N84-31844

Microfacies, depositional environments and diagenesis of the Amapa carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817

CARDIOVASCULAR SYSTEM

Conference Grant for 2nd World Congress on Biomaterials [AD-A143129] N84-31915

Pharmacologic counter measures minimizing post-space flight orthostatic intolerance — bed rest, drug disposition, and physiological function [NASA-CR-173861] N84-31936

CARRIER MOBILITY

Modelling of transfer processes in monopolar semiconductor structures with submicron dimensions N84-31453

CASCADE FLOW

Physics of ion sputtering [DE84-011664] N84-32150

CASCADE RANGE (CA-OR-WA)

Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range [DE84-012565] N84-31771

Complete Bouguer gravity anomaly map, Cascade Mountains, Washington [DE84-012548] N84-31858

CASSEGRAIN ANTENNAS

Synthesis of offset dual shaped subreflector antennas for control of Cassegrain aperture distributions [AD-P003517] N84-31485

CATALYSIS

Porous catalytic metal plate degeneration bed in a gas generator [AD-D011078] N84-31407

CATALYSTS

Mechanistic studies of catalytic methanol synthesis [DE84-006360] N84-31308

Chemical poisoning in model heterogeneous reactions [DE84-012461] N84-31315

Study of the kinetics of hydrogenation using aged catalysts [DE84-006588] N84-31330

Laser induced polymerization reactions in solid propellant binders N84-31403

The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies [DE84-009987] N84-32215

CATECHOLAMINE

Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929

CATHODE RAY TUBES

A wide field-of-view CRT projection system with optical feedback for self alignment [AD-P003447] N84-32224

CATIONS
Transport behavior of multivalent beta aluminas
[AD-A142988] N84-31382
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210
CAVITATION CORROSION
Empirical relations for cavitation and liquid impingement erosion processes
[NASA-TP-2339] N84-31349
CAVITATION FLOW
Micrometric cleaning of steel tubes through ultrasonic cavitation
[REPT-81584] N84-32125
CAVITIES
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476
Calculation of electromagnetic fields on the surface of and inside cavities — nuclear explosion effects
[SN4AS-841-422-108] N84-31506
Supersonic jet-cavity interaction pulsation N84-32089
CAVITY RESONATORS
Lumped-circuit model of four vane RFQ resonator
[DE84-011343] N84-31497
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112
CELL CATHODES
Lithium cell reactions
[AD-A142976] N84-31522
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544
CELLS
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523
CELLS (BIOLOGY)
Effects of microwaves on cell membrane permeability
[AD-A142979] N84-31913
Effects of radiofrequency radiation on differentiation of erythroleukemic cells
[AD-A143038] N84-31914
CEMENTATION
Gaseous cementation in nitrogen-methanol atmospheres
[CETIM-12-G-284] N84-31374
CENTRAL NERVOUS SYSTEM
Results of psychophysiological study of Videoton terminal operators N84-31919
Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929
CENTRAL PROCESSING UNITS
A high performance MIL-STD-1750A microprocessor
[AD-P003549] N84-31153
Architecture, hardware and software issues in fielding the next generation DOD processors
[AD-P003561] N84-31186
CENTRIFUGAL PUMPS
The Shock and Vibration Digest, volume 16, no. 4
[AD-A141077] N84-31676
Critical speed of centrifugal pumps N84-31677
CENTRIFUGES
Flow in a tapered centrifuge
[DE84-012553] N84-31573
CEPHEID VARIABLES
Theoretical study of cepheid light curves
[DE84-012453] N84-32322
CERAMICS
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012867] N84-31309
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142809] N84-31361
Ceramic heat exchanger design methodology
[DE84-010581] N84-31385
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics
[DE84-011786] N84-31392
Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
Conference Grant for 2nd World Congress on Biomaterials
[AD-A143129] N84-31915
CEREBELLUM
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
CERENKOV RADIATION
Cerenkov radiation in the neighborhood of the emission threshold
[AD-A143088] N84-32135
Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
CHANNEL FLOW
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section
[UTIAS-TN-255] N84-31583
CHANNELS (DATA TRANSMISSION)
MIL-STD-1553 interface application notes
[AD-P003539] N84-31143
A common 1553B I/O channel for the F-16
[AD-P003546] N84-31150
Advanced cockpit-systems integration
[AD-P003569] N84-31174
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
The application of convolutional codes to continuous phase modulated communication channels N84-31457
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31486
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper
[E84-10160] N84-31751
Spectral characterization of the LANDSAT Thematic Mapper sensors
[E84-10184] N84-31755
Analysis of space telescope data collection systems
[NASA-CR-171129] N84-31958
CHARACTER RECOGNITION
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
CHARACTERIZATION
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
CHARGE COUPLED DEVICES
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656
CHARGE DISTRIBUTION
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
CHARGE TRANSFER
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195
CHARGED PARTICLES
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336
CHEMICAL ANALYSIS
Analytical methods for determination of inorganic anions
[BLL-WH-592-(9091.9F)] N84-31301
Supercritical and chromotography/supersonic jet spectroscopy
[DE84-012124] N84-31312
Versatility of laser induced fluorescence line narrowing in chemical analysis
[DE84-012834] N84-31316
Development of normalized operative mode for making deposits for chemical analysis in MIG/MAG welding
[CETIM-I.S.13.826] N84-31331
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
Lithium cell reactions
[AD-A142976] N84-31522
CHEMICAL BONDS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040
CHEMICAL EQUILIBRIUM
Mechanistic studies of catalytic methanol synthesis
[DE84-008360] N84-31308
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218
CHEMICAL LASERS
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142966] N84-31622
Chemical lasers N84-32093
CHEMICAL PROPERTIES
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386
Nd-3+ Beta prime prime alumina platelet laser
[AD-A142797] N84-31621
Lubrication of machine elements
[NASA-RP-1126] N84-31640
CHEMICAL REACTIONS
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet
[NASA-TM-83757] N84-31283
Use of surface and thin film analysis techniques to study metal-organic and metal-polymer interaction
[DE84-012542] N84-31321
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323
Simulations of erosion/corrosion surface chemical reactions with a laser beam
[AD-A143001] N84-31354
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489
Lithium cell reactions
[AD-A142976] N84-31522
Effects of whole-body cold exposure on erythrocyte morphology N84-31906
CHILE
Geology of the Portrerillos District, Atacama, Chile N84-31811
CHIPS (ELECTRONICS)
Single chip MIL-STD-1553B bus interface unit keeps pace with chip sets
[AD-P003537] N84-31141
MIL-STD-1553B Marconi LSI chip set in a remote terminal application
[AD-P003538] N84-31142
MIL-STD-1553 interface application notes
[AD-P003539] N84-31143
Third generation MIL-STD-1553B LSI chip set
[AD-P003542] N84-31146
MIL-STD-1750A microprocessor chip set development
[AD-P003548] N84-31152
A MIL-STD-1750A computer employing the MDAC (McDonnell Douglas Astronautics Corporation) CMOS-SOS chipset
[AD-P003550] N84-31154
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155
Transportable GPU (General Processor Units) chip set technology for standard computer architectures
[AD-P003553] N84-31157
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
VHSIC (Very High Speed Integrated Circuits) for training systems
[AD-P003484] N84-32251
CHIPS (MEMORY DEVICES)
Circuit engineering principles for construction of bipolar large-scale integrated circuit storage devices and very large-scale main memory N84-31441
CHLORIDES
Analytical methods for determination of inorganic anions
[BLL-WH-592-(9091.9F)] N84-31301
CHLORINATION
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790
CHLORINE
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009987] N84-32215
CHOLINESTERASE
Modulation of the cholinergic mechanisms in the bronchial smooth muscle
[NDRE/PUBL-84-1001] N84-31937
CHROMATOGRAPHY
Analysis of moisture in solids: A review of the last decade or from Pande to the present
[DE84-011166] N84-31326

CHROMIUM
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83738] N84-31344
Pulsed current hard chromium plating
[CETIM-12-F-390] N84-31372
CHROMIUM ALLOYS
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion
[DE84-012366] N84-31363
CHROMOSPHERE
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335
CIRCADIAN RHYTHMS
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930
CIRCUIT BOARDS
MIL-STD-1553B in MRASM (Medium Range Air to Surface Missile): The designer's challenge
[AD-P003541] N84-31145
CIRCUIT BREAKERS
Switching transients in a superconducting coil
[DE84-012592] N84-31532
CIRCUIT PROTECTION
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534
Performance and test criteria for dc fuses, phase 1
[PB84-202662] N84-31548
CIRCUITS
The new algorithm for symbolic network analysis N84-31509
CIRCULAR CYLINDERS
A review of some Reynolds number effects related to bodies at high angles of attack
[NASA-CR-3809] N84-31097
CIRCULATION
Large-scale atmosphere-ocean coupling
[AD-A143162] N84-31873
CIVIL AVIATION
Report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A143023] N84-31103
USSR report: Transportation
[JPRS-UTR-84-024] N84-31119
CLAMPS
Double arch mirror study. Part 1: Preliminary engineering report
[NASA-CR-166589-PT-1] N84-31634
CLASSIFICATIONS
A statistical classification model for a database system N84-32279
CLAYS
Industrial forging applications of shaping simulation using modeling clay
[CETIM-1.3K.36.2] N84-31424
CLEANING
On orbit surfacing of thermal control surfaces
[NASA-CR-171121] N84-31266
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790
CLEARANCES
Blade endwall flows in an axial flow compressor stage N84-31209
CLIMATE
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases
[NASA-TM-86096] N84-31761
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776
Extending normal mode initialization: A new method
[PB84-196435] N84-31865
Effects of climate on kininogen levels in healthy human subjects N84-31907
CLIMATOLOGY
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31865
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31874
Regional wind energy assessment program
[DE84-011832] N84-31878
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886
Proceedings of the 6th Annual Climate Diagnostics Workshop
[PB84-192418] N84-31893
An ocean climate research strategy
[PB84-194828] N84-31902
CLINICAL MEDICINE
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation
[JPRS-UNE-84-001] N84-31903
Medical applications of lasers N84-31904
Age-related responses to de- and hyperhydration N84-31905
Effects of climate on kininogen levels in healthy human subjects N84-31907
CLOUD PHYSICS
AFGL cloud modeling program: Annex
[AD-A143084] N84-31872
CLOUDS
Effect of polydisperslty on the cloud point curves of polymer mixtures
[AD-A143159] N84-31384
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31874
CLOUDS (METEOROLOGY)
Model cloud relationships
[AD-A142690] N84-31871
AFGL cloud modeling program: Annex
[AD-A143084] N84-31872
CMOS
A MIL-STD-1750A computer employing the MDAC (McDonnell Douglas Astronautics Corporation) CMOS-SOS chipset
[AD-P003550] N84-31154
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155
COAL
Study of the kinetics of hydrogenation using aged catalysts
[DE84-006588] N84-31330
Performance and test criteria for dc fuses, phase 1
[PB84-202662] N84-31548
Petrography and depositional environment of the Herrin (no. 6) seam in central, eastern and northwestern Illinois N84-31813
COASTAL CURRENTS
South Atlantic physical oceanography study (year 5). Volume 1: Executive summary
[PB84-187855] N84-31899
COATING
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
COATINGS
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83738] N84-31344
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion
[DE84-012366] N84-31363
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
Dual ion beam deposition of carbon films with diamondlike properties
[NASA-TM-83743] N84-31512
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
Optical coating materials for the ultraviolet: Selection and characterization
[DE84-011504] N84-31629
COBALT ALLOYS
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys
[NASA-CR-173665] N84-31350
COBALT OXIDES
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210
COCKPITS
Advanced cockpit-systems integration
[AD-P003589] N84-31174
CODING
Results of investigation of adaptive speech codes N84-31428
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31488
The behavior of very large short pulse antennas
[DE84-012372] N84-31500
DYNA3D user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1
[DE84-012828] N84-31979
Efficient sequential designs with binary data
[AD-A142904] N84-32008
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
Physics of ion sputtering
[DE84-011664] N84-32150
COEFFICIENT OF FRICTION
Coefficient of surface friction with turbulent flow in boundary layer N84-32084
COGENERATION
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784
COLD CATHODES
Cold-cathode gas-discharge modulator power tube N84-31443
COLD PRESSING
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012967] N84-31309
COLD TOLERANCE
Effects of whole-body cold exposure on erythrocyte morphology N84-31908
COLLAPSE
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31887
COLLINEARITY
Assessment of local influence
[AD-A143002] N84-32014
COLOR
Newly discovered effect of interaction of optical radiation and glass N84-32069
COLOR PHOTOGRAPHY
Laser color recording unit
[BMFT-FB-T-84-096] N84-31633
COLORADO
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
Argillic alteration associated with the Amethyst Vein System, Creede Mining District, Colorado N84-31832
Results of a detailed gravity survey in the Alamosa area, Alamosa County, Colorado
[DE84-012186] N84-31863
COLORADO RIVER (NORTH AMERICA)
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
COLUMNS (SUPPORTS)
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974
COMBAT
Marine Corps ground simulator training needs in the 1985-1995 time frame
[AD-P003485] N84-32242
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261
COMBINATORIAL ANALYSIS
On the uniqueness of a regular thin near octagon on 288 vertices (or the semiplane belonging to the Mathieu group M12)
[MC-ZW-196/83] N84-32029
COMBUSTION
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Computational hierarchy for the analysis of combustion phenomena in ramjet environments N84-31277
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations N84-31280
Models for calculating reaction rates in turbulent, reacting flows N84-31281
Stretch effects in plane premixed hydrogen-air flames
[DE84-012035] N84-31311
Hydrogen transport, mixing, and combustion studies
[DE84-012455] N84-31317
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B
[DE84-009328] N84-31329
Gasdynamic study of model with combustion in shock tunnel N84-32061
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076
COMBUSTION CHAMBERS
Computational hierarchy for the analysis of combustion phenomena in ramjet environments N84-31277

Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83760] N84-32122

COMBUSTION CONTROL
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011081] N84-31408

COMBUSTION PHYSICS
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302

COMBUSTION PRODUCTS
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
Studies in atmospheric chemistry. Part 1: Primary peroxides from hydrocarbons. Part 2: elemental analysis using nuclear reactions
[DE84-012246] N84-31657

COMETS
Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327

COMFORT
Improving comfort of welders by reducing preheating temperatures — steel welding
[CETIM-12-Y-413] N84-31651

COMMAND AND CONTROL
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950

COMMERCIAL AIRCRAFT
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230

COMMUNICATION
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-31427
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266

COMMUNICATION CABLES
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494

COMMUNICATION EQUIPMENT
Analysis of noise temperature of optical waveguide N84-31434

COMMUNICATION NETWORKS
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode
[CRC-1375] N84-31458
NETWORK: A user oriented, interactive, station-siting program for NOAA (National Oceanic and Atmospheric Administration) VHF weather radio
[PB84-202233] N84-31978

COMMUNICATION SATELLITES
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460

COMPACTING
Investigation of shock activated sintering and shock wave consolidation of selected powder materials
[DE84-013074] N84-31391

COMPARATORS
Phase modulator in 41.650 MHz
[INPE-3177-PRE/544] N84-31515

COMPARISON
Total aerosol volume computed from laser spectrometer particle-size data for comparison with flame photometer total-mass data
[AD-A143171] N84-31306

COMPATIBILITY
Aircraft multiplexing system architecture and stores compatibility
[AD-P003530] N84-31134
Transportability of NEBULA software
[AD-P003533] N84-31137
Sodium compatibility of refractory metal alloy/304L braze joints
[DE84-012877] N84-31364

COMPENSATORS
Compensating technique using one active control scheme to nullify the accumulated effect of modeling deviation
[INPE-3181-PRE/546] N84-31996
Finite dimensional compensators for infinite dimensional systems with unbounded control action
[AD-A142806] N84-32002

COMPILERS
The evolution of the JOVIAL/J73 language from definition to use
[AD-P003518] N84-31122
Object code optimization in a standard compiler
[AD-P003520] N84-31124
Architectural and control considerations for a high speed signal processor implemented with an Ada (Trademark) executive
[AD-P003594] N84-31199

COMPLEX NUMBERS
Some observations concerning the zero-curves of the real and imaginary parts of Riemann's zeta function
[MC-ZW-201/83] N84-32030

COMPONENT RELIABILITY
Lower confidence bounds on system reliability using component data: Maximum methodology
[DE84-012813] N84-31658

COMPOSITE MATERIALS
Modern structure materials: Present situation and evolution perspectives — aircraft construction materials
[SNIAS-841-551-103] N84-31118
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft
[NASA-CR-172344] N84-31267
Dielectric cure monitoring: Preliminary studies
[NASA-TM-86452] N84-31378
Holographic test procedures for the evaluation of complicated material composites (tires)
[BMFT-FB-T-84-096] N84-31612
Graduate engineering research participation in aeronautics
[NASA-CR-173649] N84-32220

COMPOSITE STRUCTURES
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites
[AD-A142807] N84-31293
Composite structure repair
[AD-A141456] N84-31300
Simulation of vibratory processes in damped structures with temperature-frequency characteristics of vibration absorbing materials taken into account N84-32046

COMPOSITION (PROPERTY)
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519

COMPRESSED AIR
Compressed air exhaust silencers, summary
[CETIM-11-H-275] N84-31650

COMPRESSIBLE FLOW
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551

COMPRESSOR EFFICIENCY
Increase of efficiency in cooled high temperature turbines
[BMFT-FB-W-84-019] N84-31212

COMPRESSORS
Blade endwall flows in an axial flow compressor stage N84-31209

COMPUTATION
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974
A model of asynchronous iterative algorithms for solving large, sparse, linear systems
[NASA-CR-172418] N84-31988
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31996

COMPUTATIONAL FLUID DYNAMICS
Computational aerodynamics and artificial intelligence
[NASA-TM-85994] N84-31089
Potential application of artificial concepts to aerodynamic simulation
[NASA-TM-85976] N84-31093
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31098
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Stationary state computational fluid dynamics for aero-propulsion devices N84-31278
Models for calculating reaction rates in turbulent, reacting flows N84-31281
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Computational fluid mechanics utilizing the variational principle of modeling damping seals
[NASA-CR-171114] N84-31553
Transition bifurcation branches in non-linear water waves
[CAR-8418] N84-31556
A selection principle in Benard-type convection
[NASA-CR-173869] N84-31559
Nonstationary oblique-shock-wave reflections in air
[UTIAS-270] N84-31562
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section
[UTIAS-TN-255] N84-31563
Computer codes for fluid-structure interactions
[DE84-011066] N84-31578

COMPUTATIONAL GRIDS
Investigation of criteria enabling a two-dimensional grid to evolve while minimizing errors
[CETIM-100960] N84-31982
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018

COMPUTER AIDED DESIGN
Some aspects of guidance loop design for SAM systems N84-31251
Computer-Aided Engineering (CAE) in plastics technology
[CSIR-TRANS-1725] N84-31380
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517
Auxiliary programs for the Metal-Enclosed Microstrips Project
[INPE-3172-PRE/542] N84-31964
Getting into CAD at the Savannah River Plant
[DE84-011581] N84-31977
Preliminary investigations of means to transfer computer programs to the forging industry
[CETIM-1.3K.38.2] N84-31983
The influence of Computer Aided Design (CAD) on research — aircraft design
[NLR-MP-83026-U] N84-31984
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
A design automation database for computer aided design of computer systems N84-32278

COMPUTER AIDED MANUFACTURING
Computer-Aided Engineering (CAE) in plastics technology
[CSIR-TRANS-1725] N84-31380
Automation of a drop forge at the Centre Technique des Industries Mecaniques (CETIM) forge section
[CETIM-1.3K.27.3] N84-31423
Computer aided ultrasonic testing
[CETIM-15-H-404] N84-31661
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973
Study of numerical control systems for machines. Integration in flexible workshops and units
[CETIM-1.3T.042] N84-31991

COMPUTER ASSISTED INSTRUCTION
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
Guide to computer-based training
[DE84-012244] N84-31975
On-line task analyses in maintenance simulation
[AD-P003452] N84-32229
Training capabilities: The facility part of the equation
[AD-P003457] N84-32234
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P003460] N84-32237
User friendly authoring languages: An alternative approach
[AD-P003461] N84-32238
Special features of information presentation in teaching systems
[BLL-M-35604-(5828.4)] N84-32273

COMPUTER COMPATIBLE TAPES
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754

COMPUTER DESIGN
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208

COMPUTER GRAPHICS
Holographic investigation of thermal nonequilibrium vapor generation
[DE84-011905] N84-31607
METLIB-2: A program library for calculating and plotting atmospheric and oceanic fields
[PB84-205434] N84-31890
The effect of information display format on multiple-cue judgment
[AD-A142884] N84-31941

A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
Pilot climate data system user's guide
[NASA-TM-86064] N84-31956
A fast method for computer image enhancement
[INPE-3170-PRE/540] N84-31965
User's guide to Sphere and Plate Interactive Display Routine (SPIDR)
[DE84-012855] N84-31976
Getting into CAD at the Savannah River Plant
[DE84-011581] N84-31977
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32226
DMA and CIG: A shotgun wedding
[AD-P003459] N84-32236
Data base generation: Improving the state-of-the-art
[AD-P003470] N84-32245
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249

COMPUTER INFORMATION SECURITY
Fundamentals of computer security
[DE84-011476] N84-31969
Classification management. Journal of the national classification management society, volume 19, 1983
[AD-A143015] N84-32266

COMPUTER NETWORKS
Applying artificial intelligence to large networks N84-31743
Fundamentals of computer security
[DE84-011476] N84-31969
Modern control techniques for accelerators
[DE84-012521] N84-32140

COMPUTER PROGRAM INTEGRITY
Logistic support: A computer manufacturer's viewpoint
[AD-P003496] N84-32262
Automated software testing
[AD-P003496] N84-32264

COMPUTER PROGRAMMING
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85966] N84-31092
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85983] N84-31094
A programmable bus control interface
[AD-P003536] N84-31140
The use of computer ISA (Instruction Set Architectures) and software standards at Westinghouse Defense Electronics Center
[AD-P003552] N84-31156
Ada (Trademark) as a program design language. A rational approach to transitioning industry to the world of Ada through a program design language criteria
[AD-P003556] N84-31160
The Ada (Trademark) run-time environment
[AD-P003558] N84-31162
A code of practice to constrain Ada (Trademark)
[AD-P003559] N84-31163
Architecture, hardware and software issues in fielding the next generation DOD processors
[AD-P003581] N84-31186
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem
[NASA-CR-3828] N84-31217
Differential scanning calorimeter data acquisition system
[AD-A143118] N84-31600
The implementation and use of Ada on distributed systems with high reliability requirements
[NASA-CR-173841] N84-31954
Specifying the behavior of concurrent systems
[NASA-CR-173839] N84-31957
Accounting utility for determining individual usage of production level software systems
[NASA-CR-172414] N84-31959
Ada (trade name) orientation for managers L101 teacher's guide
[AD-A141646] N84-31968
Continuation of research in computer simulation of integrated circuits
[AD-A143005] N84-31970
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
NETWORK: A user oriented, interactive, station-siting program for NOAA (National Oceanic and Atmospheric Administration) VHF weather radio
[PB84-202233] N84-31978
Abstraction, specification and implementation techniques with an application to garbage collection — data processing
[MATH-CENTRE-TRACTS-166] N84-31980
WARN: A warning formatter
[PB84-204551] N84-31985
HEART OF GOLD: Computer routines for large sparse, least squares computations
[PB84-196492] N84-31987
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
The arithmetic of differentiation
[AD-A142964] N84-32011
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P003460] N84-32237
User-friendly software: The role of the user
[AD-P003469] N84-32256
Automated software testing
[AD-P003498] N84-32264
Automatic audit information system for software development
[AD-P003499] N84-32265

COMPUTER PROGRAMS
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85966] N84-31092
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85983] N84-31094
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112
Extensions and modifications to the ARL point-performance program
[AD-A142078] N84-31113
The NEBULA and MCF (Military Computer Family) standardization programs
[AD-P003531] N84-31135
Transportability of NEBULA software
[AD-P003533] N84-31137
Standard avionics software: The future strategy for cost-effective avionics
[AD-P003582] N84-31187
LANTIRN (Low Altitude Navigation and Targeting Infrared System for Night) - tommorrow's software development today
[AD-P003583] N84-31188
Standardized computing system SDS80
[AD-P003585] N84-31190
Tri-service Combined Altitude Radar Altimeter (CARA): The Army perspective
[AD-P003586] N84-31191
Cost/schedule management for software development
[AD-P003591] N84-31196
Software configuration management in a project environment
[AD-P003592] N84-31197
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem
[NASA-CR-3828] N84-31217
Reliability analysis of an ultra-reliable fault tolerant control system
[NASA-CR-166594] N84-31219
Application of finite element substructuring to composite micromechanics
[NASA-TM-83729] N84-31288
The application of convolutional codes to continuous phase modulated communication channels N84-31457
A comparative study of linear array synthesis technique using a personal computer
[AD-P003500] N84-31488
The APL RCS (Radar Cross Section)/statistics code description, illustrations of output, and user's guide
[AD-A142929] N84-31490
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491
RFQ simulation code
[DE84-011385] N84-31499
The behavior of very large short pulse antennas
[DE84-012372] N84-31500
The new algorithm for symbolic network analysis N84-31509
Survey and assessment of heat of reaction type chemical heat pumps
[DE84-010988] N84-31576
Computer codes for fluid-structure interactions
[DE84-011068] N84-31578
Differential scanning calorimeter data acquisition system
[AD-A143118] N84-31600
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31658
Transient 3-dimensional thermoelasticity by the integral equations method
[CETIM-11-B-071] N84-31717
Simplified approach to two-dimensional cyclic plasticity problems
[CETIM-11-B-110] N84-31718
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31847
Three-dimensional computer model for the atmospheric general circulation experiment
[NASA-CR-171109] N84-31863
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886
A computer calculation and display station for slosh hurricane surge model data
[PB84-198753] N84-31887
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
NIMBUS 7 Earth Radiation Budget (ERB) matrix user's guide. Volume 2: Tape specifications
[NASA-CR-170620] N84-31961
Implementation of INTERLISP on the VAX
[AD-A141707] N84-31967
A software scheme for managing magnetic tape storage space
[AD-A142847] N84-31969
User's guide to Sphere and Plate Interactive Display Routine (SPIDR)
[DE84-012855] N84-31976
Investigation of criteria enabling a two-dimensional grid to evolve while minimizing errors
[CETIM-100980] N84-31982
Guidelines for software production in developed countries
[PB84-202796] N84-31986
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
Smoothing on the frequency domain
[INPE-3162-PRE/547] N84-31997
The nonlinear dynamics of spinning paraboloidal antennas N84-32033
Physics of ion sputtering
[DE84-011664] N84-32150
Mathematical model for a simplified Bridgman-Stockbarger crystal growing system
[NASA-CR-171108] N84-32202
Logical optimization for database uniformization
[NASA-CR-173836] N84-32282
An evaluation of the system 2000 data base management system for use in major item system mapping
[DE84-013130] N84-32296

COMPUTER STORAGE DEVICES
Circuit engineering principles for construction of bipolar large-scale integrated circuit storage devices and very large-scale main memory N84-31441
Princeton VLSI project
[AD-A142959] N84-31521
DEC LSI-11/HP9895A software
[DE84-012412] N84-31952

COMPUTER SYSTEMS DESIGN
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
Synthetic aperture radar simulation
[AD-P003474] N84-32246
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
A design automation database for computer aided design of computer systems N84-32278
A non-first-normal-form relational database model N84-32280
A physical database design methodology using the property of separability N84-32281

COMPUTER SYSTEMS PERFORMANCE
Modern control techniques for accelerators
[DE84-012521] N84-32140

COMPUTER SYSTEMS PROGRAMS
Automatic finite element generators N84-31695

Interactive finite elements for general engine dynamics analysis N84-31698
Extension of finite element programs to thermoelastoviscoplastic domains
[CETIM-11-A-102] N84-31716
Preliminary study on elastoplasticity in large transformations
[CETIM-11-E-360] N84-31719
NONAX-TRANAX-CASTOR 2D — structural analysis programs
[CETIM-100840] N84-31721
Fracture mechanics formulas on microcomputers
[CETIM-100960] N84-31722
Software design issues in the implementation of hierarchical display editors N84-31953
Signal analysis and data processing system (acoustic and vibratory)
[CETIM-11-H-50-9] N84-31961
Data base management of software development
[AD-P003486] N84-32253
Software documentation support
[AD-P003487] N84-32254

COMPUTER TECHNIQUES
Architecture, hardware and software issues in fielding the next generation DOD processors
[AD-P003581] N84-31186
The 6M x 6M low speed wind tunnel N84-31221
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470
Development of a computer-assisted simulation of tactical voice communications. Phase 1: Conceptual design
[AD-A143098] N84-31482
Voice integrated presentation system
[AD-D011076] N84-31485
Computer simulation of surface and film processes
[NASA-CR-173682] N84-31662
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
Knowledge based engineering for spatial database management and use N84-31745
The potential of AI techniques for remote sensing N84-31748
DMA (Defense Mapping Agency): The digital revolution
[AD-A142767] N84-31767
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955
A software scheme for managing magnetic tape storage space
[AD-A142847] N84-31969
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973
Preliminary investigations of means to transfer computer programs to the forging industry
[CETIM-1.3K.38.2] N84-31983
Fundamental research in applied mathematics
[AD-A143123] N84-32016
Modular image analysis system
[BMFT-FB-T-84-074] N84-32177
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT
[AD-A142788] N84-32267
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276

COMPUTERIZED SIMULATION
Potential application of artificial concepts to aerodynamic simulation
[NASA-TM-85976] N84-31063
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85871] N84-31215
Optimal low-thrust transfers to geosynchronous orbit N84-31240
Optimization of the capture process for a rigid satellite stabilized by gravity gradient
[INPE-3184-PRE/549] N84-31245
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83778] N84-31348
Development of a computer-assisted simulation of tactical voice communications. Phase 1: Conceptual design
[AD-A143098] N84-31482
Operational parameters of a 2.0-MeV RFQ linac
[DE84-011366] N84-31490
RFQ simulation code
[DE84-011365] N84-31499
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE84-006935] N84-31572
A numerical simulation of heat transfer in evaporative cooling towers
[DE84-001142] N84-31580
Radial SI latches vibration test data review
[NASA-TM-86454] N84-31636
Computer simulation of surface and film processes
[NASA-CR-173682] N84-31662
Three-dimensional computer model for the atmospheric general circulation experiment
[NASA-CR-171109] N84-31863
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
Specifying the behavior of concurrent systems
[NASA-CR-173839] N84-31957
Continuation of research in computer simulation of integrated circuits
[AD-A143005] N84-31970
Reentry analysis
[DE84-012640] N84-32167
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249
Software progress tracking system
[AD-P003488] N84-32255
Logistic support: A computer manufacturer's viewpoint
[AD-P003498] N84-32262

COMPUTERS
A MIL-STD-1750A computer employing the MDAC (McDonnell Douglas Astronautics Corporation) CMOS-SOS chipset
[AD-P003550] N84-31154
MIL-STD-1750A verification testing
[AD-P003555] N84-31159
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-31427
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1
[NASA-CR-170619] N84-31960
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271
European scientific notes, volume 38, no. 5
[AD-A141713] N84-32285
Terminal oversight: The editor and the word processor
[DE84-012656] N84-32295

CONCATENATED CODES
Probability of undetected error after decoding for a concatenated coding scheme
[NASA-CR-173837] N84-31992

CONCENTRATION (COMPOSITION)
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

CONCRETE STRUCTURES
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Considerations on deformable ability and ultimate strength of seismic walls. Part 2: About the derivation of a formula on ultimate shearing stress of walls and its applied verification for some experimental results N84-32042

CONDUCTION
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491

CONDUCTIVE HEAT TRANSFER
Ammonia boiling in long tubes. Heat transfer and charge loss in vertical and horizontal tubes
[CETIM-14-C-011] N84-31586

CONDUCTIVITY
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539

CONES
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063

CONFERENCES
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 1
[AD-A142776] N84-31121
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 2
[AD-A142777] N84-31185
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 3: Embedded computer resources governing documents
[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
Advanced Technology for SAM Systems Analysis Synthesis and Simulation
[AGARD-LS-135] N84-31248
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31405
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31688
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting
[E84-10176] N84-31738
Annotated bibliography of global resources information systems related publications N84-31746
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Noise as a public health problem, volume 2
[AD-A142413] N84-31800
AFGL cloud modeling program: Annex
[AD-A143084] N84-31872
Proceedings of the 8th Annual Climate Diagnostics Workshop
[PB84-192416] N84-31893
Microwave and far infrared spectroscopy of transient molecules
[AD-A142982] N84-32134
Refractory alloy technology for space nuclear power applications
[DE84-001745] N84-32166
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Calendar of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341

CONFIDENCE LIMITS
Statistical inference for reliability from stress strength relationships: The normal case
[AD-A142893] N84-32005
Bi- and poly-optimal confidence limits for a location and parameter
[AD-A142960] N84-32012
Strong confidence intervals: A compromise between the Gaussian and the slash
[AD-A142961] N84-32021

CONFIGURATION MANAGEMENT
Software control and system configuration management: A systems-wide approach [NASA-TM-85908] N84-31112
Software configuration management in a project environment [AD-P003592] N84-31197
Managing aircraft/simulator concurrency [AD-P003463] N84-32240

CONGRUENCES
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1 [AD-A143085] N84-32015

CONSERVATION EQUATIONS
An investigation of single-substance horizontal two-phase flow [DE84-012292] N84-31587

CONSERVATION LAWS
An investigation of single-substance horizontal two-phase flow [DE84-012292] N84-31587
Conservation laws of wave action and potential enstrophy for Rossby waves in a stratified atmosphere [NASA-TM-86058] N84-31838

CONSTANTS
Cooling of seminfinite body under conditions of nonlinear heat transfer at surface N84-32075

CONSTRAINTS
The application of convolutional codes to continuous phase modulated communication channels N84-31457
Retractable tie-down device [AD-D011079] N84-31643

CONTACT LENSES
Ophthalmological investigation among contact lens wearers in military service [REPT-AR/MHAM-1983-1] N84-31940

CONTENT
Content duplication among documents on specific subjects N84-32274

CONTINENTAL SHELVES
South Atlantic physical oceanography study (year 5). Volume 1: Executive summary [PB84-187855] N84-31899

CONTINUOUS RADIATION
Comparison of simulation and measurement techniques for continuous waves and pulses [SNIAS-841-422-103] N84-31501

CONTINUOUS WAVE LASERS
Nd-3+ Beta prime prime alumina platelet laser [AD-A142797] N84-31621
Time-dependent oscillations in a CW HF chemical laser unstable resonator [AD-A142966] N84-31622
Medical applications of lasers N84-31904

CONTINUOUS WAVE RADAR
The behavior of very large short pulse antennas [DE84-012372] N84-31500

CONTINUUM MODELING
Continuum theory for fiber suspensions [DE84-012258] N84-31584

CONTRACT MANAGEMENT
Effectiveness of multi-year and advance procurement contracts [AD-P003462] N84-32239
The Program Planning Review (PPR): Milestone or millstone? [AD-P003493] N84-32259
Profit responsibilities in the simulation and training equipment industry [AD-P003497] N84-32263

CONTRACTS
Cost and schedule control systems criteria for contract performance measurement, information pamphlet [DE84-012576] N84-32269
Text processing in the writing of contracts [SNIAS-841-422-102] N84-32297

CONTRAST
A fast method for computer image enhancement [INPE-3170-PRE/540] N84-31985

CONTROL
Some aspects of guidance loop design for SAM systems N84-31251
Digital control loading: A microprocessor-based approach [AD-P003483] N84-32250

CONTROL SURFACES
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner [AD-A142773] N84-31099
Unsteady aerodynamics of fast moving control surfaces [BMFT-FB-W-84-020] N84-31117

CONTROL THEORY
Acoustic excitation: A promising new means of controlling shear layers [NASA-TM-83772] N84-31096
Investigation, development and application of optimal output feedback theory. Volume 2: Development of an optimal, limited state feedback outer-loop digital flight control system for 3-D terminal area operation [NASA-CR-3829] N84-31218
Active controls: A look at analytical methods and associated tools [NASA-TM-86269] N84-31684
Compensating technique using one active control scheme to nullify the acummulated effect of modelling deviation [INPE-3181-PRE/546] N84-31996
Directional convexity and finite optimality conditions [AD-A141696] N84-32000
One method of assessing the validity of organizational-systems modelling [BLL-M-35605-(5828.4)] N84-32222

CONTROLLED ATMOSPHERES
Gaseous cementation in nitrogen-methanol atmospheres [CETIM-12-G-264] N84-31374

CONTROLLED SYSTEMS DESIGN
Active controls: A look at analytical methods and associated tools [NASA-TM-86269] N84-31684

CONTROLLERS
An adaptive attitude controller for terrestrial artificial satellites [INPE-3186-PRE/551] N84-31243

CONVECTION
Research study: Organization and development of organized convection in the boundary layer [NASA-CR-171115] N84-31552
A selection principle in Benard-type convection [NASA-CR-173869] N84-31559
Oscillatory instability in a 2-fluid Benard problem [AD-A142792] N84-31565
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31807
Applications of the AVE-SESAME data sets to mesoscale studies [NASA-CR-3819] N84-31866
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization [DE84-011895] N84-31874

CONVECTION CLOUDS
Doppler-radar observation of the evolution of downdrafts in convective clouds [NASA-CR-173874] N84-31896

CONVECTION CURRENTS
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111

CONVECTIVE HEAT TRANSFER
Cooling of seminfinite body under conditions of nonlinear heat transfer at surface N84-32075

CONVERGENCE
Numerical solution of viscoplastic flow problems by augmented lagrangians [AD-A142793] N84-31566
Convergence of bivariate cardinal interpolation [AD-A142894] N84-32006
Globally convergent procedures for solving nonlinear minimization problems [AD-A142905] N84-32009
Spline approximation for retarded systems and the Ricatti equation [AD-A142963] N84-32010

CONVEXITY
Geodetic graphs and convexity N84-31729
Asteroid light inversion [NASA-CR-173864] N84-32316

COOLANTS
Status of the development of a long-life engine coolant system [AD-A143098] N84-31642
The Shock and Vibration Digest, volume 16, no. 7 [AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680
Space reactor fuels performance and development issues [DE84-011414] N84-32164

COOLERS
Laboratory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment [PB84-182146] N84-31426

COOLING
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure [DE84-012395] N84-31361
A numerical simulation of heat transfer in evaporative cooling towers [DE84-901142] N84-31580
Heat pipe technology development for high temperature space radiator applications [DE84-012444] N84-31581

COOLING SYSTEMS
Status of the development of a long-life engine coolant system [AD-A143098] N84-31642

COORDINATES
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087
Potential application of artificial concepts to aerodynamic simulation [NASA-TM-85976] N84-31093
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion [NASA-CR-3822] N84-31216
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551

COPPER
Geology of the Portrerillos District, Atacama, Chile N84-31611
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828
Microstructural stability of copper electroplate [DE84-010070] N84-32174

COPPER ALLOYS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Influence of copper on MAG deposits [CETIM-12-Y-431] N84-31375
Ocean thermal energy conversion: Materials issues [DE84-012094] N84-31790

CORIOLIS EFFECT
The nonlinear dynamics of spinning paraboloidal antennas N84-32033

CORNERS
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner [AD-A142773] N84-31099

CORRELATION
An investigation of single-substance horizontal two-phase flow [DE84-012292] N84-31587
Correlation of afferent activity and binocular receptive field properties [AD-A143087] N84-31938

CORROSION
Perspective of the corrosive behavior of lithium and sodium [DE84-011635] N84-31362
Ocean thermal energy conversion: Materials issues [DE84-012094] N84-31790

CORROSION PREVENTION
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion [NASA-TM-83738] N84-31344
Status of the development of a long-life engine coolant system [AD-A143098] N84-31642

CORROSION RESISTANCE
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Powder metallurgy of light metal alloys for demanding applications [AD-A142066] N84-31352
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion [DE84-012386] N84-31363

CORROSION TESTS
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Simulations of erosion/corrosion surface chemical reactions with a laser beam [AD-A143001] N84-31354

COSMIC DUST
Study of variable extinction of hot stars with circumstellar dust shells [NASA-CR-173844] N84-32315

COSMONAUTS
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232
First mixed crew in space N84-31917

COST ANALYSIS
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P003588] N84-31193
Cost/schedule management for software development
[AD-P003591] N84-31196
A computerbsed system for establishing electric-vehicle battery requirements
[DE84-011728] N84-31545
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
Software design issues in the implementation of hierarchical display editors N84-31953
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003463] N84-32230
Cost and schedule control systems criteria for contract performance measurement, information pamphlet
[DE84-012576] N84-32269
The Electric Vehicle Project
[DE84-011788] N84-32309

COST EFFECTIVENESS
Increase of efficiency in cooled high temperature turbines
[BMFT-FB-W-84-019] N84-31212
Cost effectiveness of converting to alternative motor vehicle fuels. A technical assistance study for the city of Longview
[DE84-010479] N84-31415
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P003455] N84-32232
Cost-effective and efficient maintenance training devices: A user accepted design process
[AD-P003456] N84-32233
Effectiveness of multi-year and advance procurement contracts
[AD-P003462] N84-32239
Increased readiness through modularity
[AD-P003491] N84-32257
Profit responsibilities in the simulation and training equipment industry
[AD-P003487] N84-32263

COST REDUCTION
Feasibility study of a low cost Energy Performance Management System (EPMS) — automatic flight control
[BMFT-FB-W-84-015] N84-31116
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-165319] N84-31783

COSTS
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886

COUNTERS
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy
[DE84-011638] N84-31320
Digital rotation measurement unit
[DE84-010672] N84-31526

COUPLING
Adaptive antennas for tropospheric radio relay lines N84-31432
Normal zone detectors for a large number of inductively coupled coils, revision 1
[DE84-011053] N84-31526
Large-scale atmosphere-ocean coupling
[AD-A143162] N84-31873

COUPLINGS
Shaft coupling device
[AD-D011060] N84-31644

CRACK GEOMETRY
Enhanced Fourier algorithms for ultrasonic crack characterization
[DE84-012544] N84-31714

CRACK INITIATION
Crack initiation model for stress corrosion cracking alpha-brass
[DE84-012837] N84-31712

CRACK PROPAGATION
Fracto-emission from graphite/epoxy composites
[NASA-CR-173845] N84-31291
Environmentally-controlled crack growth rate of type 304 stainless steel in high temperature sulfate solutions N84-31342
Failure analysis of plasma-sprayed thermal barrier coatings
[NASA-TM-83777] N84-31347
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83778] N84-31348
The effects of deformation mode and microstructure fracture-related properties of Ti alloys
[AD-A142891] N84-31353
Crack kinetics of the nickel-hydrogen system N84-31685
Inelastic and dynamic fracture and stress analyses N84-31697
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy
[AD-A142059] N84-31702
Effect of inertia on finite near-tip deformation for fast Mode-3 crack growth
[AD-A142947] N84-31706
Interdependence of equivalent steady stress, crack growth and failure on sequence and amplitude of irregular loading
[AD-A142951] N84-31707
Crack initiation model for stress corrosion cracking alpha-brass
[DE84-012837] N84-31712

CRACK TIPS
Effect of inertia on finite near-tip deformation for fast Mode-3 crack growth
[AD-A142947] N84-31706

CRACKING (FRACTURING)
Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue
[DE84-012911] N84-31367
State of techniques for cracking varnishes and problems posed by their application
[CETIM-1.5C.23.1] N84-31723

CRACKS
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297

CRASHWORTHINESS
Simulated crash decelerations in a light aircraft cabin
[AD-A142606] N84-31102

CRATERING
Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327

CREEP ANALYSIS
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672

CREEP PROPERTIES
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012867] N84-31309
Creep of six glues
[CETIM-1.3N.16.2] N84-31398
The changes in the compressive and tensile yield strengths during uniaxial cyclic loading N84-31674
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709

CREEP STRENGTH
Development of improved low-strain creep strength in Cabot alloy R-41 sheet — nickel base sheet alloy for reentry shielding
[NASA-CR-172392] N84-31346

CROSS SECTIONS
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
Electron capture cross sections in high energy He2+ + neutral Li collisions
[IPPJ-679] N84-32182

CRUDE OIL
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
Microfacies, depositional environments and diagenesis of the Amapa carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817

CRUSHERS
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-061] N84-31659

CRUSTS
Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819

CRYOGENIC COOLING
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417

CRYOGENIC EQUIPMENT
Field ion microscopy and spectroscopy of hydrogen in metals
[DE84-012972] N84-31388
Operating modes of superconducting current converters in service N84-31445

CRYOGENICS
Development of a transimpedance amplifier for cryotemperatures, study — high sensitivity infrared detectors
[BMFT-FB-W-84-023] N84-31610
Double arch mirror study. Part 2: Engineering analysis report
[NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report
[NASA-CR-166589-PT-3] N84-31636
Double arch mirror study
[NASA-CR-166589] N84-31637

CRYSTAL DEFECTS
Studies of hydrogenated amorphous silicon
[DE84-011886] N84-32211

CRYSTAL GROWTH
Mathematical model for a simplified Bridgman-Stockbarger crystal growing system
[NASA-CR-171108] N84-32202
X-ray diffraction study of the phase composition of the crystallization medium and inclusions in synthetic diamonds
[CSIR-TRANS-1723] N84-32203
Superlattice structures grown by molecular beam epitaxy
[DE84-011288] N84-32209

CRYSTAL LATTICES
In-situ TEM investigations of graphic-epitaxy and small particles
[NASA-CR-166593] N84-32201

CRYSTAL STRUCTURE
Statistical-mechanical study of polyvinylidene fluoride
[AD-A143040] N84-31383
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation
[CSIR-TRANS-1726] N84-31842

CRYSTAL SURFACES
Energy redistribution in diatomic molecules on surfaces
[DE84-011442] N84-32213

CRYSTALLITES
Crystallite size and support effects on CO hydrogenation reactions
[DE84-012474] N84-31314

CRYSTALLIZATION
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics
[DE84-011786] N84-31392
X-ray diffraction study of the phase composition of the crystallization medium and inclusions in synthetic diamonds
[CSIR-TRANS-1723] N84-32203

CRYSTALLOGRAPHY
Electromagnetic effects in strong field of single crystals N84-32084

CRYSTALS
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2
[BLL-M-35595-(5828.4)] N84-31337
Geology hydrology and mineral resources of crystaline rock areas of Northeastern US
[DE84-013671] N84-31774
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081

CUBIC LATTICES
Grinding with Borazon: Progress and rewards
[CSIR-TRANS-1718] N84-31420

CUES
Visual cueing effectiveness: Comparison of perception and flying performance
[AD-P003458] N84-32235
DMA and CIG: A shotgun wedding
[AD-P003459] N84-32236
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003466] N84-32243

CURRENT CONVERTERS (AC TO DC)
Operating modes of superconducting current converters in service N84-31445

CURRENT DENSITY
The effect of current density on anode depolarization economics
[DE84-010485] N84-31524
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
CURVE FITTING
Application of an adaptive noise technique on state estimation to data smoothing
[INPE-3187-PRE/552] N84-31963
CYCLIC HYDROCARBONS
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333
CYCLIC LOADS
The changes in the compressive and tensile yield strengths during uniaxial cyclic loading N84-31674
Cyclic torsion testing
[NASA-TM-83756] N84-31687
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
Interdependence of equivalent steady stress, crack growth and failure on sequence and amplitude of irregular loading
[AD-A142951] N84-31707
Simplified approach to two-dimensional cyclic plasticity problems
[CETIM-11-B-110] N84-31718
CYCLOHEXANE
Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components
[AD-A143028] N84-32205
CYCLOTRON RADIATION
Second harmonic electron cyclotron emission studies of Tokapole-2 plasmas
[DE84-013103] N84-32193
CYCLOTRON RESONANCE DEVICES
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517
CYLINDRICAL ANTENNAS
Moebius r-2R lens
[AD-P003511] N84-31479
CYLINDRICAL SHELLS
A shear deformable shell element for laminated composites N84-31691
CYLINDRICAL TANKS
Effect of external pressure environment on the internal noise level due to a source inside a cylindrical tank
[NASA-TM-85814] N84-31226

D

DAMAGE
Recent damage results for antireflection coatings at 355 NM
[DE84-011560] N84-31388
Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
DAMAGE ASSESSMENT
Role of texture and structural damage in plane strain deformation processing N84-31664
DAMPING
Digital control system for space structural dampers
[NASA-CR-173867] N84-31267
Critical speed of centrifugal pumps N84-31677
DATA ACQUISITION
Distributed problem solving for air fleet control: Framework and implementations
[AD-A143168] N84-31108
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
Global resources information system N84-31747
Two years experience testing solar collectors in Brazil
[INPE-3221-RPE/461] N84-31785
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31864
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31865
Regional wind energy assessment program
[DE84-011832] N84-31878
Assessment of local influence
[AD-A143002] N84-32014
Key to oceanographic records documentation
[PB84-186360] N84-32299
DATA BASE MANAGEMENT SYSTEMS
APSE database user scenario
[AD-P003593] N84-31198
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
NASA pilot land data system N84-31741
Advanced data structure and geographic information systems N84-31742
Applying artificial intelligence to large networks N84-31743
Knowledge based engineering for spatial database management and use N84-31745
Annotated bibliography of global resources information systems related publications N84-31746
The potential of AI techniques for remote sensing N84-31748
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886
Pilot climate data system user's guide
[NASA-TM-86064] N84-31956
Software documentation support
[AD-P003487] N84-32254
A design automation database for computer aided design of computer systems N84-32278
Logical optimization for database uniformization
[NASA-CR-173836] N84-32282
Energy Data Base. Serial titles with ISSN listing
[DE84-003676] N84-32289
Energy Data Base corporate author entries
[DE84-003677] N84-32290
Data base management system of the National Low-Level Radioactive Waste Management Program
[DE84-012789] N84-32291
An evaluation of the system 2000 data base management system for use in major item system mapping
[DE84-013130] N84-32296
DATA BASES
APSE database user scenario
[AD-P003593] N84-31198
Aerothermodynamic data base, phase C
[NASA-CR-173862] N84-31259
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
RFQ simulation code
[DE84-011385] N84-31499
NASA pilot land data system N84-31741
Advanced data structure and geographic information systems N84-31742
Knowledge based engineering for spatial database management and use N84-31745
Annotated bibliography of global resources information systems related publications N84-31746
Inventory of numeric data for carbon dioxide research, revision 1
[DE84-013683] N84-31881
DMA and CIG: A shotgun wedding
[AD-P003459] N84-32236
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003468] N84-32243
An approach to a standardized simulator data base
[AD-P003469] N84-32244
Data base generation: Improving the state-of-the-art
[AD-P003470] N84-32245
Synthetic aperture radar simulation
[AD-P003474] N84-32246
Data base management of software development
[AD-P003486] N84-32253
A design automation database for computer aided design of computer systems N84-32278
A statistical classification model for a database system N84-32279
A non-first-normal-form relational database model N84-32280
A physical database design methodology using the property of separability N84-32281
New technical information media
[CSIR-TRANS-1731] N84-32284
Resource contention, synchronization, and information structure in distributed systems
[AD-A143037] N84-32287
Energy Data Base corporate author entries
[DE84-003677] N84-32290
Review of existing environmental and natural resource data bases
[DE84-012039] N84-32292
Key to oceanographic records documentation
[PB84-186360] N84-32299
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-186655] N84-32301
DATA COLLECTION PLATFORMS
Phase modulator in 41.650 MHz
[INPE-3177-PRE/544] N84-31515
DATA CORRELATION
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85863] N84-31094
A method to combine remotely sensed and in situ measurements: Program documentation
[E84-10172] N84-31735
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31846
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31865
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931
Psychophysics of proprioceptive sensibility N84-31933
DATA LINKS
Digital transmission: 68Mbit/s pal field trial system
[BBC-RD-1984/5] N84-31455
Analysis of space telescope data collection systems
[NASA-CR-171129] N84-31958
DATA MANAGEMENT
Software configuration management in a project environment
[AD-P003592] N84-31197
Global resources information system N84-31747
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
Data base generation: Improving the state-of-the-art
[AD-P003470] N84-32245
Data base management of software development
[AD-P003486] N84-32253
DATA PROCESSING
Attitude determination using strapdown inertial sensors and adaptive estimation
[INPE-3160-PRE/545] N84-31106
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
Applying artificial intelligence to large networks N84-31743
Annotated bibliography of global resources information systems related publications N84-31746
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31847
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31864
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1
[NASA-CR-170619] N84-31960
Guidelines for software production in developed countries
[PB84-202795] N84-31986
Fundamentals of computer security
[DE84-011476] N84-31989
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271
Data base management system of the National Low-Level Radioactive Waste Management Program
[DE84-012789] N84-32291
Key to oceanographic records documentation
[PB84-186360] N84-32299
DATA PROCESSING EQUIPMENT
Development of a multidetector deflection measurement system
[DE84-013580] N84-31631
DATA PROCESSING TERMINALS
Auxiliary programs for the Metal-Enclosed Microstrips Project
[INPE-3172-PRE/542] N84-31964
DATA RECORDERS
Laser color recording unit
[BMFT-FB-T-84-096] N84-31633
DATA RECORDING
A multi-GHz multi-channel photonic analog data processing system
[DE84-012281] N84-32175
DATA RETRIEVAL
Applying artificial intelligence to large networks N84-31743
Global resources information system N84-31747
A statistical classification model for a database system N84-32279
DATA SMOOTHING
Application of an adaptive noise technique on state estimation to data smoothing
[INPE-3187-PRE/552] N84-31963
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997

DATA STORAGE
A software scheme for managing magnetic tape storage space
[AD-A142847] N84-31988
Abstraction, specification and implementation techniques with an application to garbage collection — data processing
[MATH-CENTRE-TRACTS-166] N84-31980
Key to oceanographic records documentation
[PB84-186360] N84-32299

DATA SYSTEMS
BRESEX: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface
[NASA-CR-173673] N84-31271

DATA TRANSMISSION
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode
[CRC-1375] N84-31458
DEC LSI-11/HP9885A software
[DE84-012412] N84-31952
Analysis of space telescope data collection systems
[NASA-CR-171129] N84-31956

DEATH VALLEY (CA)
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31816

DECIMETER WAVES
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431

DECISION MAKING
Knowledge-based expert systems for crop identification N84-31744
The effect of information display format on multiple-cue judgment
[AD-A142884] N84-31941
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
Guide to computer-based training
[DE84-012244] N84-31975
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31998
Activities in applied systems analysis N84-32026
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P003455] N84-32232
Equitable assignment rules
[AD-A142809] N84-32268

DECODING
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31488

DECOMMISSIONING
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-009591] N84-32165

DECOMPOSITION
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Porous catalytic metal plate degeneration bed in a gas generator
[AD-D011078] N84-31407

DECOMPRESSION SICKNESS
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58262] N84-31935

DEFECTS
Dynamic overstresses in fibrous polymeric materials
[DE84-012605] N84-31394

DEFENSE INDUSTRY
Defense industry attitudes about AF interface standards report of an electronics industries association survey
[AD-P003570] N84-31175

DEFENSE PROGRAM
MIL-STD defense system software development
[AD-P003580] N84-31195
DMA (Defense Mapping Agency) policy for digital MC and G (Mapping, Charting, and Geodesy) support of advanced systems
[AD-A142746] N84-31785
Increased readiness through modularity
[AD-P003491] N84-32257
Classification management. Journal of the national classification management society, volume 19, 1983
[AD-A143015] N84-32286

DEFLECTION
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099
Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174671] N84-31274
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31686

DEFORMATION
Viscoelastic and aging characteristics of polymers
[DE84-012668] N84-31393
Numerical solution of viscoplastic flow problems by augmented lagrangians
[AD-A142793] N84-31566
Role of texture and structural damage in plane strain deformation processing N84-31664
Inelastic and dynamic fracture and stress analyses N84-31697
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
Effect of inertia on finite near-tip deformation for fast Mode-3 crack growth
[AD-A142947] N84-31706

DEFROSTING
Comparative study of heat pump regulation systems. The problem of defrosting evaporators
[CETIM-100250] N84-31589

DEGASSING
Hydrogen fatigue test — plated bolts
[CETIM-12-F-400] N84-31373

DEGENERATION
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142695] N84-32007

DEGREES OF FREEDOM
The response of nonlinear structures to random excitation N84-31678

DEHYDRATION
Age-related responses to de- and hyperhydration N84-31905

DELAMINATING
Composite structure repair
[AD-A141456] N84-31300

DELTA MODULATION
Results of investigation of adaptive speech codes N84-31428

DENSE PLASMAS
Protective plasma envelope
[DE84-013316] N84-32194

DENSIFICATION
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012667] N84-31309

DENSITY
Conference Grant for 2nd World Congress on Biomaterials
[AD-A143129] N84-31915

DENSITY (MASS/VOLUME)
Density fluctuations in premixed turbulent flames
[DE84-012055] N84-31322

DENSITY DISTRIBUTION
Nonlinear inverse methods applied to interpreting gravity anomalies produced by multi-interfaced geologic bodies N84-31822
Protective plasma envelope
[DE84-013316] N84-32194
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335

DENSITY MEASUREMENT
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074

DEPOLARIZATION
The effect of current density on anode depolarization economics
[DE84-010465] N84-31524

DEPOSITION
Deposits on light alloys — aluminum
[CETIM-12-F-380] N84-31371
Dual ion beam deposition of carbon films with diamondlike properties
[NASA-TM-83743] N84-31512
Urban and local source effects on precipitation chemistry
[DE84-011848] N84-31803
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
Depositional environment and petrology of the Medicine Peak Quartzite (early proterozoic), southern Wyoming N84-31829

DEPOSITS
The neogene stratigraphy of the Central Florida Panhandle N84-31833

DEPTH
Investigation of role of subsurface zones in wear of materials
[DE84-012752] N84-31365

DESIGN
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784

DESIGN ANALYSIS
Software modifications to the Demonstration Advanced Avionics Systems (DAAS)
[NASA-TM-85842] N84-31105
Wing design for minimum drag with practical constraints N84-31109
Achieving the benefits of modular avionics design
[AD-P003562] N84-31167
Application of TCS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
Helium thruster propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
Digital control system for space structural dampers
[NASA-CR-173867] N84-31267
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
Operational parameters of a 2.0-MeV RFQ linac
[DE84-011368] N84-31486
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
Double arch mirror study. Part 1: Preliminary engineering report
[NASA-CR-166589-PT-1] N84-31634
Positive displacement compounding of a heavy duty diesel engine
[NASA-CR-168286] N84-31641
The changes in the compressive and tensile yield strengths during uniaxial cyclic loading N84-31674
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean
[AD-A142873] N84-31850
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
Future accelerators using micro-fabrication technology
[DE84-002692] N84-32157
Pulsed high-current source of negatively charged hydrogen ions
[DE84-012969] N84-32158
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32166
Operation of electric vehicles in the US Department of Energy test program
[DE84-011703] N84-32308

DESIGN TO COST
A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010078] N84-31797

DETECTION
Plasma discharge elemental detector for a mass spectrometer
[DE84-011078] N84-31604

DETONATION WAVES
Airblast simulations using flux-corrected transport codes
[AD-A142820] N84-31567

DETONATORS
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406

DEUTERIUM COMPOUNDS
Microstructural studies of hydrogen and deuterium in BCC refractory metals
[DE84-011506] N84-31357

DEVELOPING NATIONS
Guidelines for software production in developed countries
[PB84-202795] N84-31986
DIAGNOSIS
Proceedings of the 6th Annual Climate Diagnostics Workshop
[PB84-192418] N84-31893
DIAMONDS
New sapphire and ruby components and their manufacture using diamond abrasives
[CSIR-TRANS-1734] N84-31419
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation
[CSIR-TRANS-1726] N84-31842
X-ray diffraction study of the phase composition of the crystallization medium and inclusions in synthetic diamonds
[CSIR-TRANS-1723] N84-32203
DIAPHRAGMS (MECHANICS)
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section
[UTIAS-TN-255] N84-31563
DIATOMIC MOLECULES
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32163
Energy redistribution in diatomic molecules on surfaces
[DE84-011442] N84-32213
DICHROISM
Newly discovered effect of interaction of optical radiation and glass N84-32069
DIELECTRIC PROPERTIES
Dielectric cure monitoring: Preliminary studies
[NASA-TM-86452] N84-31378
Properties of bubble domains in cholesteric-nematic mixtures N84-32039
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics N84-32052
DIELECTRICS
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31266
Dielectric-grating band-pass filters N84-31442
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
Axial-conductances angular filter investigation
[AD-A142602] N84-31487
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489
Auxiliary programs for the Metal-Enclosed Microstripe Project
[INPE-3172-PRE/542] N84-31964
Cerenkov radiation in the neighborhood of the emission threshold
[AD-A143068] N84-32135
DIELS-ALDER REACTIONS
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218
DIES
Construction of a test bench for closed die forging
[CETIM-5.580.50] N84-31425
DIESEL ENGINES
Positive displacement compounding of a heavy duty diesel engine
[NASA-CR-168286] N84-31641
The 100 area diesel performance data
[DE84-011136] N84-31648
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306
Waste heat recovery from adiabatic diesel engines by exhaust-driven Brayton cycles
[NASA-CR-168257] N84-32307
DIFFERENCE EQUATIONS
Fundamental research in applied mathematics
[AD-A143123] N84-32016
DIFFERENTIAL EQUATIONS
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Exponential-fitted methods for integrating stiff systems of ordinary differential equations: Applications to homogeneous gas-phase chemical kinetics N84-31279
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations N84-31280
Spline approximation for retarded systems and the Ricatti equation
[AD-A142963] N84-32010
Research in nonlinear motion
[AD-A143000] N84-32013
DIFFERENTIAL PULSE CODE MODULATION
Results of investigation of adaptive speech codes N84-31428
DIFFERENTIATION
Effects of radiofrequency radiation on differentiation of erythroleukemic cells
[AD-A143038] N84-31914
The arithmetic of differentiation
[AD-A142964] N84-32011
DIFFRACTION
Apparatus based on holographic focusing diffraction grating for measurement of diffraction efficiency of three-dimensional image holograms N84-32068
DIFFRACTION PATTERNS
Measurement of integrated circuit element dimensions taking into account real etching profile according to diffraction pattern N84-31437
DIFFUSION
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83738] N84-31344
Environment and fracture
[DE84-011454] N84-31360
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171127] N84-31837
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
[AD-A143142] N84-32172
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210
DIFFUSION COEFFICIENT
Diffusion transfer during near-sonic turbulence N84-32090
DIFFUSION THEORY
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802
DIGITAL COMPUTERS
A comparative study of linear array synthesis technique using a personal computer
[AD-P003500] N84-31488
Thinking big
[DE84-007412] N84-31951
Implementation of INTERLISP on the VAX
[AD-A141707] N84-31987
DIGITAL DATA
Digital transmission: 68Mbit/s pal field trial system
[BBC-RD-1984/5] N84-31455
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10179] N84-31750
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754
DMA (Defense Mapping Agency) policy for digital MC and G (Mapping, Charting, and Geodesy) support of advanced systems
[AD-A142746] N84-31765
DMA (Defense Mapping Agency): The digital revolution
[AD-A142787] N84-31767
An approach to a standardized simulator data base
[AD-P003469] N84-32244
DIGITAL SIMULATION
Investigation, development and application of optimal output feedback theory. Volume 2: Development of an optimal, limited state feedback outer-loop digital flight control system for 3-D terminal area operation
[NASA-CR-3629] N84-31218
DIGITAL SYSTEMS
Application of JOVIAL (J-73) to digital flight controls
[AD-P003525] N84-31129
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166
Digital avionics design for validation
[AD-P003571] N84-31176
Investigation, development and application of optimal output feedback theory. Volume 2: Development of an optimal, limited state feedback outer-loop digital flight control system for 3-D terminal area operation
[NASA-CR-3629] N84-31218
Digital control system for space structural dampers
[NASA-CR-173987] N84-31257
Results of investigation of adaptive speech codes N84-31428
Digital transmission: 68Mbit/s pal field trial system
[BBC-RD-1984/5] N84-31455
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523
Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31762
DMA (Defense Mapping Agency): The digital revolution
[AD-A142787] N84-31767
A wide field-of-view CRT projection system with optical feedback for self alignment
[AD-P003447] N84-32224
Image generator architectures and features
[AD-P003449] N84-32226
An approach to a standardized simulator data base
[AD-P003469] N84-32244
Synthetic aperture radar simulation
[AD-P003474] N84-32246
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250
DIGITAL TECHNIQUES
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754
DIMERS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040
DIODES
P-I-N Diode Switches Project
[INPE-3171-PRE/541] N84-31516
DIOPHANTINE EQUATION
Upper bounds for the numbers of solutions of diophantine equations
[MATH-CENTRE-TRACTS-166] N84-32019
DIPOLE ANTENNAS
Moebius r-2R lens
[AD-P003511] N84-31479
DIPOLES
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
DIRECT CURRENT
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450
Performance and test criteria for dc fuses, phase 1
[PB84-202662] N84-31548
Waveguide CO2 laser with 7.5 W power rating N84-32098
DIRECTION FINDING
Multiple source DF (Direction Finding) signal processing: An experimental system
[AD-P003515] N84-31483
DIRECTIONAL ANTENNAS
Feed error effects on lens performance
[AD-P003513] N84-31481
A dual-ported, dual-polarized spherical near-field probe
[AD-P003514] N84-31482
DIRECTIVITY
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
DISCRIMINATION
Discrimination of iron alteration minerals in remote sensing data N84-31727
The discrimination of pitch in pulse trains and speech
[AD-A142998] N84-32127

DISKS
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018
DISPERSIONS
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297
DISPLACEMENT
Nonlinear displacement analysis of advanced propeller structures using NASTRAN
[NASA-TM-83737] N84-31683
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31686
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974
DISPLACEMENT MEASUREMENT
Development of a multidetector deflection measurement system
[DE84-013580] N84-31631
DISPLAY DEVICES
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
Equipment for monitoring and control of television transmitters N84-31435
Results of psychophysiological study of Videoton terminal operators N84-31919
The effect of information display format on multiple-cue judgment
[AD-A142984] N84-31941
User's guide to Sphere and Plate Interactive Display Routine (SPIDR)
[DE84-012855] N84-31976
Liquid crystal materials for matrix displays
[AD-A143039] N84-32206
Improved materials for DC dynamic scattering at elevated temperatures
[AD-A143076] N84-32207
DISSOCIATION
Electromagnetic dissociation of radioactive heavy-ion beams
[DE84-012266] N84-32146
DISTRIBUTED PROCESSING
The impact of NEBULA, MCF (Military Computer Family), and Ada (Trademark) on real-time embedded computer systems
[AD-P003534] N84-31138
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003677] N84-31182
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
Resource contention, synchronization, and information structure in distributed systems
[AD-A143037] N84-32287
DISTRIBUTION FUNCTIONS
Statistical inference for reliability from stress strength relationships: The normal case
[AD-A142693] N84-32005
Investigation of statistical characteristics of random signals in nonlinear medium N84-32066
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32336
DIURNAL VARIATIONS
Observations of long-period motions of the Earth at the South Pole N84-31823
Variability in the height distribution of electrojet currents of Jicamarca
[INPE-3205-PRE/563] N84-31840
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
DIVERGENCE
Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174671] N84-31274
DOCUMENTATION
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
Software documentation support
[AD-P003487] N84-32254
Practical writing and editing techniques
[DE84-012642] N84-32294
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295
DOCUMENTS
Content duplication among documents on specific subjects N84-32274
DOPES
Studies of hydrogenated amorphous silicon
[DE84-011888] N84-32211
DOPPLER RADAR
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31896
DOSIMETERS
Optical density radiation dose relationship — radiography
[CETIM-100660] N84-32162
DRAFTING (DRAWING)
Getting into CAD at the Savannah River Plant
[DE84-011581] N84-31977
DRILLING
Temperature profiles from Salt Valley, Utah
[DE84-900996] N84-31854
DROP SIZE
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174636] N84-31595
DROPSONDES
The Project STRAFAM: Test of a new parachute based instrument carrier for stratospheric research — dropsondes
[BMFT-FB-W-84-021] N84-31859
DROUGHT
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil
[INPE-3214-PRE/567] N84-31867
DRUGS
Pharmacologic counter measures minimizing post-space flight orthostatic intolerance — bed rest, drug disposition, and physiological function
[NASA-CR-173861] N84-31936
DUCTED FLOW
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
DUCTS
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B
[DE84-009326] N84-31329
DUNES
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830
DWARF NOVAE
On the masses of white dwarfs in cataclysmic binaries N84-32323
DYE LASERS
New type of dye laser with light-induced distributed feedback N84-32067
Experiments in development of powerful dye laser N84-32095
Optically pumped polarized alkali atomic beams and targets
[DE84-012389] N84-32147
DYES
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31801
DYNAMIC CHARACTERISTICS
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules
[AD-A143017] N84-31303
Dynamic characteristic of intense short microwave propagation in an atmosphere
[DE84-002786] N84-31496
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31565
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680
Interactive finite elements for general engine dynamics analysis N84-31698
Improved materials for DC dynamic scattering at elevated temperatures
[AD-A143076] N84-32207
DYNAMIC MODELS
An on-line equivalent system identification scheme for adaptive control N84-31213
Attitude dynamics of the Galileo spacecraft N84-31262
DYNAMIC PROGRAMMING
Nonnegative matrices in dynamic programming
[MATH-CENTRE-TRACTS-167] N84-32028
DYNAMIC RESPONSE
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114
Radial Si latches vibration test data review
[NASA-TM-86454] N84-31638
Critical speed of centrifugal pumps N84-31677
Direct generation of seismic floor response spectra for classically and nonclassically damped structures
[PB84-191675] N84-31880
DYNAMIC STRUCTURAL ANALYSIS
Active controls: A look at analytical methods and associated tools
[NASA-TM-86269] N84-31684
Interactive finite elements for general engine dynamics analysis N84-31698
NASTRAN-based computer program for structural dynamic analysis of horizontal axis wind turbine
[DE84-011257] N84-31713
Simplified approach to two-dimensional cyclic plasticity problems
[CETIM-11-B-110] N84-31718
State of techniques for crackling varnishes and problems posed by their application
[CETIM-1.5C.23.1] N84-31723
DYNAMIC TESTS
Radial Si latches vibration test data review
[NASA-TM-86454] N84-31638

E

EARLY STARS
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312
EARLY WARNING SYSTEMS
National Hurricane Operations Plan
[PB84-196837] N84-31888
EARTH (PLANET)
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31782
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327
Galactic cycles and their relationship to life on Earth
[DE84-011737] N84-32329
EARTH ATMOSPHERE
Practical applications of a space station
[NASA-CR-173672] N84-31270
EARTH CORE
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
EARTH CRUST
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
Results of a detailed gravity survey in the Alamosa area, Alamosa County, Colorado
[DE84-012188] N84-31853
Statistical tests for detecting crustal movements using Bayesian inference
[PB84-196811] N84-31861
EARTH MANTLE
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31565
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
EARTH MOVEMENTS
Statistical tests for detecting crustal movements using Bayesian inference
[PB84-196811] N84-31861
EARTH OBSERVATIONS (FROM SPACE)
USSR report: Space
[JPRS-USP-84-004] N84-31228
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232
Azerbaijan Institute develops subsatellite measurement systems N84-31236
BRESEX: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface
[NASA-CR-173673] N84-31271
EARTH ORBITS
Pravda cites advantages of project for orbiting solar reflectors N84-31235
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511

Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31763

EARTH RADIATION BUDGET EXPERIMENT
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1
[NASA-CR-170619] N84-31960

EARTH RESOURCES
Azerbaijan Institute develops subsatellite measurement systems N84-31238
Review of existing environmental and natural resource data bases
[DE84-012039] N84-32292

EARTH RESOURCES PROGRAM
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725

EARTH ROTATION
Observations of long-period motions of the Earth at the South Pole N84-31823

EARTH TIDES
Observations of long-period motions of the Earth at the South Pole N84-31823

EARTHQUAKE DAMAGE
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901

EARTHQUAKES
Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901

ECOLOGY
Inventory of numeric data for carbon dioxide research, revision 1
[DE84-013683] N84-31881

ECONOMETRICS
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P003455] N84-32232

ECONOMIC ANALYSIS
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
Activities at the Brookhaven National Laboratory integrated test bed for advanced hydrogen technology
[DE84-010226] N84-31409
A pioneer deep ocean mining venture
[PB84-199645] N84-31780
Wind energy: a brief assessment
[DE84-012208] N84-31788
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Ergonomic analysis of human operation of video terminal N84-31918
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340

ECONOMIC DEVELOPMENT
Technology, innovation and regional economic development. Background paper 2: Encouraging high-technology development
[PB84-180181] N84-32310

ECONOMIC FACTORS
CO2 forecasting and control: A mathematical approach
[DE84-013454] N84-31882

ECONOMICS
Economics of hydrogen production: The next 25 years
[DE84-007279] N84-31414
The effect of current density on anode depolarization economics
[DE84-010465] N84-31524
Directory of computerized data files, 1984
[PB84-160126] N84-32303

ECONOMY
Activities in applied systems analysis N84-32026

ECOSYSTEMS
NASA pilot land data system N84-31741
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776

EDDINGTON APPROXIMATION
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312

EDGES
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073

EDITING
Practical writing and editing techniques
[DE84-012642] N84-32294
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295

EDITING ROUTINES (COMPUTERS)
Software design issues in the implementation of hierarchical display editors N84-31953

EDUCATION
Ada (trade name) orientation for managers L101 teacher's guide
[AD-A141846] N84-31968
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973
Guide to computer-based training
[DE84-012244] N84-31975
Weibull analysis handbook
[AD-A143100] N84-32023
European scientific notes, volume 38, no. 5
[AD-A141713] N84-32285

EFFECTIVE PERCEIVED NOISE LEVELS
Effect of external pressure environment on the internal noise level due to a source inside a cylindrical tank
[NASA-TM-85814] N84-31226

EFFERENT NERVOUS SYSTEMS
Variability of practice and the transfer of training of motor skills
[AD-A142896] N84-31942
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A142919] N84-31947

EFFICIENCY
SERI photovoltaics advanced research and development: FY 1983 accomplishments
[DE84-004493] N84-31789

EIGENVALUES
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31565
PLTMGC: A multi-grid continuation program for parameterized nonlinear elliptic systems
[DE84-010406] N84-32017

EJECTION SEATS
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406

EJECTORS
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273

ELASTIC BARS
Oscillations of elastic airplane due to wind gust N84-32087

ELASTIC BUCKLING
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667

ELASTIC DEFORMATION
Longitudinal vibrations of rods of finite length with radial deformation
[AD-A142674] N84-31703

ELASTIC PROPERTIES
Compound strip methods for the analysis of continuous elastic plates N84-31670
The nonlinear dynamics of spinning paraboloidal antennas N84-32033

ELASTIC WAVES
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31708
A three-dimensional ray method and its application to the study of wave propagation in crustal structure with curved layers N84-31821
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110

ELASTOHYDRODYNAMICS
Lubrication of machine elements
[NASA-RP-1126] N84-31640

ELASTOPLASTICITY
Preliminary study on elastoplasticity in large transformations
[CETIM-11-E-360] N84-31719

ELECTRIC ARCS
A review of anode phenomena in vacuum arcs
[DE84-012371] N84-31547
Further effects of ions in the arcs
[DE84-011761] N84-32149
Dual arc penning ion source gas flow experiments
[DE84-011637] N84-32151

ELECTRIC BATTERIES
Batteries and accumulators for future Aerospatiale projects
[SNIAS-841-422-111] N84-31282
AC propulsion system for an electric vehicle, phase 2
[NASA-CR-168244] N84-31514
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523
Active material redistribution rates in zinc electrodes: Effect of alkaline electrolyte compositions having reduced zinc oxide solubility
[DE84-010709] N84-31525
Enhanced low-temperature performance of a multicell LiSOCl sub 2 battery
[DE84-011680] N84-31537
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539
Study of bipolar batteries
[DE84-013193] N84-31540
Test and evaluation of the Philips Model PE 1701 and Lester Model 9665 electric vehicle battery chargers
[DE84-901243] N84-31541
Multicell LiSOCl sub 2 reserve battery
[DE84-012812] N84-31542
A computerized system for establishing electric-vehicle battery requirements
[DE84-011728] N84-31545

ELECTRIC CHARGE
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523

ELECTRIC COILS
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534

ELECTRIC CONDUCTORS
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539

ELECTRIC CONNECTORS
MIL-STD-1760 development program
[AD-P003526] N84-31130
Aircraft-store Electrical Interconnection System (AEIS) functional requirements
[AD-P003527] N84-31131
Signal set standardization for the aircraft-store electrical interconnection system
[AD-P003528] N84-31132
Consideration of MIL-STD-1760, aircraft/store electrical interface standard on stores management system architectures
[AD-P003529] N84-31133
Multi-criteria approach to selection of optimal connections in large-scale integrated circuits N84-31436

ELECTRIC CONTACTS
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519

ELECTRIC CURRENT
Steady state performance of single-phase reaction motor N84-32035
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-006034] N84-32206

ELECTRIC DISCHARGES
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268
Plasma discharge elemental detector for a mass spectrometer
[DE84-011078] N84-31604

ELECTRIC FIELDS
Statistical-mechanical study of polyvinylidene fluoride
[AD-A143040] N84-31383
Lumped-circuit model of four vane RFQ resonator
[DE84-011343] N84-31497
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
Calculating electric fields in semiconductor structures when singularities are present N84-32051
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073
Waveguide CO2 laser with 7.5 W power rating N84-32098
Using ions to probe the transverse size of a bunch
[DE84-012772] N84-32141
Azimuthal electric fields and tandem ambipolarity
[DE84-010843] N84-32189

ELECTRIC FILTERS
Axial-conductance angular filter investigation
[AD-A142802] N84-31487

ELECTRIC FUSES
Performance and test criteria for dc fuses, phase 1
[PB84-202992] N84-31548
ELECTRIC GENERATORS
The 100 area diesel performance data
[DE84-011136] N84-31648
ELECTRIC HYBRID VEHICLES
A computerized system for establishing electric-vehicle battery requirements
[DE84-011728] N84-31545
ELECTRIC MOTOR VEHICLES
AC propulsion system for an electric vehicle, phase 2
[NASA-CR-168244] N84-31514
Test and evaluation of the Philips Model PE 1701 and Lester Model 9985 electric vehicle battery chargers
[DE84-901243] N84-31541
Operation of electric vehicles in the US Department of Energy test program
[DE84-011703] N84-32308
The Electric Vehicle Project
[DE84-011766] N84-32309
ELECTRIC MOTORS
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450
Optimum control of electric motor drives for industrial robots
[DE84-012878] N84-31543
ELECTRIC OUTLETS
A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010078] N84-31797
ELECTRIC POTENTIAL
Normal zone detectors for a large number of inductively coupled coils, revision 1
[DE84-011053] N84-31526
ELECTRIC POWER PLANTS
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534
The 100 area diesel performance data
[DE84-011136] N84-31648
Using gas-turbine power stations with aircraft engines for power-and-heat generation
[AD-A142084] N84-31786
ELECTRIC PULSES
Signal set standardization for the aircraft-store electrical interconnection system
[AD-P003828] N84-31132
Pulsed current hard chromium plating
[CETIM-12-F-390] N84-31372
ELECTRIC TERMINALS
Ergonomic analysis of human operation of video terminal N84-31918
Results of psychophysiological study of Videoton terminal operators N84-31919
ELECTRIC WIRE
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
ELECTRICAL ENGINEERING
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221
ELECTRICAL FAULTS
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534
ELECTRICAL IMPEDANCE
Energy storage capacitors. Lecture 4: Appendix
[DE84-010040] N84-31546
ELECTRICAL INSULATION
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
ELECTRICAL MEASUREMENT
Analysis of moisture in solids: A review of the last decade or from Pande to the present
[DE84-011166] N84-31326
ELECTRICAL PROPERTIES
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476
Nd-3+ Beta prime prime alumina platelet laser
[AD-A142797] N84-31621
Steady state performance of single-phase reaction motor N84-32035
Improvement in quality of silicon-based amorphous films N84-32041
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-006034] N84-32208
ELECTRICAL RESISTIVITY
Kinetics of complexation of the macrocycles 18C6 and 12C4 ethers with LiAsF-6 in 1,2-dimethoxyethane at 25 deg C
[AD-A143086] N84-31304
Energy storage capacitors. Lecture 4: Appendix
[DE84-010040] N84-31546
Improved materials for DC dynamic scattering at elevated temperatures
[AD-A143076] N84-32207
ELECTRICITY
USSR report: Physics and mathematics
[JPRS-UPM-84-006] N84-32061
ELECTRO-OPTICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
Embedded information transfer technology assessment
[AD-A142849] N84-31518
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
A multi-GHz multi-channel photonic analog data processing system
[DE84-012281] N84-32175
Radiation effects in optoelectronic devices
[DE84-012880] N84-32176
Liquid crystal materials for matrix displays
[AD-A143039] N84-32206
ELECTROCHEMICAL CELLS
Lithium cell reactions
[AD-A142976] N84-31522
ELECTROCHEMICAL OXIDATION
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
ELECTROCHEMISTRY
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31330
Transport behavior of multivalent beta aluminas
[AD-A142988] N84-31382
ELECTRODE MATERIALS
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544
ELECTRODES
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
A review of anode phenomena in vacuum arcs
[DE84-012371] N84-31547
Calculating electric fields in semiconductor structures when singularities are present N84-32051
ELECTROENCEPHALOGRAPHY
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A142919] N84-31947
ELECTROFORMING
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys
[NASA-CR-173865] N84-31350
ELECTROJETS
Variability in the height distribution of electrojet currents of Jicamarca
[INPE-3205-PRE/563] N84-31640
ELECTROLESS DEPOSITION
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561
ELECTROLYSIS
Rationale for US DOE energy storage program in hydrogen technology
[DE84-010225] N84-31411
Economics of hydrogen production: The next 25 years
[DE84-007279] N84-31414
ELECTROLYTES
Active material redistribution rates in zinc electrodes: Effect of alkaline electrolyte compositions having reduced zinc oxide solubility
[DE84-010709] N84-31525
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539
ELECTROLYTIC CELLS
Activities at the Brookhaven National Laboratory integrated test bed for advanced hydrogen technology
[DE84-010226] N84-31409
Water vapor electrolysis: Systems considerations and cost/performance benefits
[DE84-007389] N84-31410
Lithium cell reactions
[AD-A142976] N84-31522
The effect of current density on anode depolarization economics
[DE84-010465] N84-31524
Enhanced low-temperature performance of a multicell LiSOC1sub2 battery
[DE84-011680] N84-31537
ELECTROMAGNETIC ABSORPTION
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338
ELECTROMAGNETIC FIELDS
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489
Calculation of electromagnetic fields on the surface of and inside cavities — nuclear explosion effects
[SNIAS-841-422-108] N84-31506
Electromagnetic theory of an antenna for ICR heating of a plasma in Tokamaks
[DE84-012998] N84-32200
ELECTROMAGNETIC INTERACTIONS
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491
ELECTROMAGNETIC INTERFERENCE
A technique for simulating conduction interference created by electromagnetic pulses (EMP)
[SNIAS-841-422-104] N84-31502
ELECTROMAGNETIC PULSES
The behavior of very large short pulse antennas
[DE84-012372] N84-31500
Comparison of simulation and measurement techniques for continuous waves and pulses
[SNIAS-841-422-103] N84-31501
A technique for simulating conduction interference created by electromagnetic pulses (EMP)
[SNIAS-841-422-104] N84-31502
Calculation of low altitude electromagnetic pulses in the first moments — after a nuclear explosion
[SNIAS-841-422-105] N84-31503
Coupling of electromagnetic pulses created by a nuclear explosion on the ground with overhead power cables
[SNIAS-841-422-107] N84-31505
Calculation of currents induced in a network of overhead power lines by an electromagnetic impulse
[SNIAS-841-422-109] N84-31507
Test means and methods linked to experiments on systems — electromagnetic pulse effects
[SNIAS-841-422-110] N84-31508
High power RF klystrons for linear accelerators
[DE84-012074] N84-31527
PIXE and PBFA 2: Pulsed X-ray source feasibility study
[DE84-011535] N84-32155
ELECTROMAGNETIC RADIATION
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Investigation of Bragg reflection of electromagnetic surface waves by diffraction grating N84-32053
Electromagnetic excitation of sound in metals N84-32082
Electromagnetic dissociation of radioactive heavy-ion beams
[DE84-012266] N84-32146
Electromagnetic radiation and scattering in a plasma with azimuthal biasing field N84-32160
ELECTROMAGNETIC SCATTERING
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489
Electromagnetic radiation and scattering in a plasma with azimuthal biasing field N84-32160
ELECTROMAGNETIC WAVE TRANSMISSION
Homing head imperfections altering missile guidance N84-31256
ELECTROMAGNETISM
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
ELECTRON ACCELERATORS
Beam experiment programs in the USA
[DE84-010804] N84-32138
ELECTRON BEAM WELDING
Investigation of in position end to end welding of an aluminum alloy by electron beam
[CETIM-12-Y-442] N84-31652
ELECTRON BEAMS
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074
Plasma beam instability of bounded electron beam in weak magnetic field N84-32105
Generation and application of finely focused low energy electron beams N84-32129

Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
Beam experiment programs in the USA
[DE84-010604] N84-32138
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214

ELECTRON BUNCHING
Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
Using ions to probe the transverse size of a bunch
[DE84-012772] N84-32141
Further effects of ions in the arcs
[DE84-011761] N84-32149

ELECTRON CAPTURE
Electron capture cross sections in high energy He2+ + neutral Li collisions
[IPPJ-679] N84-32182

ELECTRON CYCLOTRON HEATING
Ray tracing study of electron cyclotron heating in the TBR 2 Tokamak
[INPE-3192-PRE/556] N84-32181

ELECTRON DENSITY (CONCENTRATION)
Alternating acoutoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449
Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil
[INPE-3038-PRE/489] N84-31839
Production of dense plasma column in strong magnetic fields and its diagnosis by laser methods N84-32104

ELECTRON DENSITY PROFILES
Comparison between density profiles obtained at Cachoeira Paulista, Brazil, and deduced from IRI-79 model
[INPE-3136-PRE/527] N84-31843
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198

ELECTRON DISTRIBUTION
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3206-PRE/564] N84-31244
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338

ELECTRON EMISSION
Fracto-emission from graphite/epoxy composites
[NASA-CR-173845] N84-31291
Second harmonic electron cyclotron emission studies of Tokapole-2 plasmas
[DE84-013103] N84-32193

ELECTRON ENERGY
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3200-PRE/564] N84-31244
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Second harmonic electron cyclotron emission studies of Tokapole-2 plasmas
[DE84-013103] N84-32193

ELECTRON GUNS
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517

ELECTRON IRRADIATION
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214

ELECTRON MICROSCOPY
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214

ELECTRON PLASMA
Electromagnetic radiation and scattering in a plasma with azimuthal biasing field N84-32180

ELECTRON SCATTERING
Electromagnetic excitation of sound in metals N84-32082
Resonances in electron-molecule scattering and photoionization
[DE84-012660] N84-32139

ELECTRON STATES
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32183

ELECTRON TRANSITIONS
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
Optical stark effect in the 2-photon spectrum of NO
[NASA-TM-85964] N84-32131

ELECTRONIC EQUIPMENT
MIL-STD-1553B validation testing
[AD-P003544] N84-31148

ELECTRONIC EQUIPMENT TESTS
MIL-STD-1553B validation testing
[AD-P003544] N84-31148
MIL-STD-1553: Testing and test equipment
[AD-P003545] N84-31149
Status of the development of a long-life engine coolant system
[AD-A143098] N84-31642

ELECTRONIC MODULES
Achieving the benefits of modular avionics design
[AD-P003582] N84-31167
Navy packaging standardization thrusts
[AD-P003564] N84-31169
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460

ELECTRONIC PACKAGING
Monolithic microwave integrated circuits: Interconnections and packaging considerations
[NASA-TM-83774] N84-31461

ELECTRONICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
Monolithic microwave integrated circuits: Interconnections and packaging considerations
[NASA-TM-83774] N84-31461
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32061

ELECTRONS
Nonequilibrium optical and acoustic phonons in semiconductors N84-32085
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation
[NASA-TM-86131] N84-32333
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338

ELECTROPLATING
Pulsed current hard chromium plating
[CETIM-12-F-390] N84-31372
Hydrogen fatigue test — plated bolts
[CETIM-12-F-400] N84-31373
Engineering properties of some coatings
[DE84-002715] N84-31390
Microstructural stability of copper electroplate
[DE84-010070] N84-32174

ELECTROSLAG WELDING
Preliminary investigation of ways to improve the strength of vertical electroslag welding
[CETIM-100-020] N84-31654

ELECTROSTATIC CHARGE
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848

ELECTROSTATIC ENGINES
Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174671] N84-31274

ELECTROSTATIC PROBES
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3206-PRE/564] N84-31244

ELECTROSTATICS
Relativistic vector sub p x vector sub b acceleration of charged particles by an obliquely propagating electrostatic wave
[IPPJ-680] N84-32183

ELECTROTHERMAL ENGINES
The annular flow electrothermal ramjet
[NASA-CR-174704] N84-31275

ELEVATION
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356

ELLIPSOMETERS
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446

ELLIPTIC DIFFERENTIAL EQUATIONS
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142995] N84-32007
PLTMGC: A multi-grid continuation program for parameterized nonlinear elliptic systems
[DE84-010406] N84-32017

ELLIPTICAL ORBITS
Non-integrability of planar oscillation equation for satellite in elliptical orbit N84-32109

EMBEDDED COMPUTER SYSTEMS
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 1
[AD-A142776] N84-31121
The evolution of the JOVIAL/J73 language from definition to use
[AD-P003518] N84-31122
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
Feasibility assessment of JOVIAL to Ada (Trademark) translation
[AD-P003523] N84-31127
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software
[AD-P003524] N84-31128
The NEBULA standard computer architecture
[AD-P003532] N84-31136
The impact of NEBULA, MCF (Military Computer Family), and Ada (Trademark) on real-time embedded computer systems
[AD-P003534] N84-31138
A programmable bus control interface
[AD-P003536] N84-31140
MIL-STD-1750A microprocessor chip set development
[AD-P003548] N84-31152
A high performance MIL-STD-1750A microprocessor
[AD-P003549] N84-31153
MIL-STD-1750A as a spaceborne instruction set architecture
[AD-P003554] N84-31158
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 2
[AD-A142777] N84-31165
An integrated approach to a successful embedded computer resource project
[AD-P003574] N84-31179
Architecture, hardware and software issues in fielding the next generation DOD processors
[AD-P003581] N84-31186
A corporate approach to an embedded software development and support standard
[AD-P003589] N84-31194
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 3: Embedded computer resources governing documents
[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260

EMBEDDING
Embedded information transfer technology assessment
[AD-A142649] N84-31518

EMBRITTLEMENT
Crack kinetics of the nickel-hydrogen system
N84-31685

EMISSION
Wall quench and flammability limit effects on exhaust hydrocarbon emission
[DE84-009754] N84-31307
Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy
[DE84-009246] N84-31327
Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction
[DE84-012079] N84-31879

EMISSION SPECTRA
Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
The physical nature of the symbiotic stars
N84-32325
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85980] N84-32328
Three-dimensional model for fusion processes
[DE84-011731] N84-32339

EMULSIONS
Method of making fine-grained triaminotrinitrobenzene
[DE84-012754] N84-31413

ENERGY ABSORPTION
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173848] N84-32115

ENERGY BUDGETS
Observations of radiation exchange above and below Amazonian forest
[INPE-3194-PRE/558] N84-31870

ENERGY CONSERVATION
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31586

ENERGY CONSUMPTION
Operation of electric vehicles in the US Department of Energy test program
[DE84-011703] N84-32308

ENERGY CONVERSION EFFICIENCY
Advantages of metallic fuels for rocket propulsion
N84-31237
Cost effectiveness of converting to alternative motor vehicle fuels. A technical assistance study for the city of Longview
[DE84-010479] N84-31415
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783
Solar thermal parabolic dish systems: Technology and applications
[DE84-012239] N84-31792
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009363] N84-32288

ENERGY DISTRIBUTION
Theoretical studies of the pulsar magnetosphere
N84-31809
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
Energy redistribution in diatomic molecules on surfaces
[DE84-011442] N84-32213

ENERGY GAPS (SOLID STATE)
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529

ENERGY LEVELS
Theory of 4-wave mixing for VUV generation
[DE84-011663] N84-31630

ENERGY POLICY
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784
Activities in applied systems analysis N84-32026
European scientific notes, volume 38, no. 5
[AD-A141713] N84-32295
Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-189158] N84-32302

ENERGY STORAGE
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
Rationale for US DOE energy storage program in hydrogen technology
[DE84-010225] N84-31411
Technology base research project for electrochemical energy storage
[DE84-012248] N84-31535
Study of bipolar batteries
[DE84-013193] N84-31540
Energy storage capacitors. Lecture 4: Appendix
[DE84-010040] N84-31548
Magnetically confined kinetic-energy storage ring: A new fundamental energy-storage concept
[DE84-011531] N84-31793
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

ENERGY TECHNOLOGY
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009363] N84-32288
Energy Data Base corporate author entries
[DE84-003877] N84-32290

ENERGY TRANSFER
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE84-008935] N84-31572
Theory of 4-wave mixing for VUV generation
[DE84-011663] N84-31630
Electromagnetic theory of an antenna for ICR heating of a plasma in Tokamaks
[DE84-012988] N84-32200

ENGINE COOLANTS
Status of the development of a long-life engine coolant system
[AD-A143098] N84-31642

ENGINE DESIGN
Computational hierarchy for the analysis of combustion phenomena in ramjet environments N84-31277
Interactive finite elements for general engine dynamics analysis N84-31698
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

ENGINE MONITORING INSTRUMENTS
Research study of pressure instrumentation
[NASA-CR-171143] N84-31599

ENGINE NOISE
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83780] N84-32122

ENGINE PARTS
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
Three-dimensional stress analysis using the boundary element method N84-31700

ENGINE TESTS
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study
[AD-A143104] N84-31211

ENGINES
Inelastic and dynamic fracture and stress analyses
N84-31697

ENTRAINMENT
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31807

ENTROPY
Predictions of entropies of molecules and liquids
[DE84-010504] N84-32216

ENVIRONMENT EFFECTS
Activities in applied systems analysis N84-32026

ENVIRONMENT MODELS
NASA pilot land data system N84-31741
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802

ENVIRONMENT POLLUTION
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-009591] N84-32165

ENVIRONMENT PROTECTION
US EPA (Environmental Protection Agency) regional oxidant model, background and overview
[PB84-201660] N84-31606

ENVIRONMENT SIMULATION
Simulations of erosion/corrosion surface chemical reactions with a laser beam
[AD-A143001] N84-31354

ENVIRONMENTAL MONITORING
Environmental Research Laboratories publication abstracts, FY 1983
[PB84-189323] N84-31892
Review of existing environmental and natural resource data bases
[DE84-012039] N84-32292

ENVIRONMENTS
Wind energy: a brief assessment
[DE84-012206] N84-31788

EPITAXY
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics
N84-32052
In-situ TEM investigations of graphic-epitaxy and small particles
[NASA-CR-166593] N84-32201

EPOXIDATION
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009667] N84-32215

EPOXY MATRIX COMPOSITES
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites
[NASA-CR-173870] N84-31289
Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites
[SNIAS-841-551-102] N84-31298

EPOXY RESINS
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites
[NASA-CR-173870] N84-31289
Nuclear Magnetic Resonance (NMR) study of glass fiber-epoxy resin composites in the solid state
N84-31299
Dielectric cure monitoring: Preliminary studies
[NASA-TM-86452] N84-31378

EQUATIONS OF MOTION
Flow in a tapered centrifuge
[DE84-012553] N84-31573
Differential equations for movement of triaxial gyroscopic stabilizer on moving base N84-32107

EQUATIONS OF STATE
Usual initial and final state effects in quantum chromodynamics
[DE84-010422] N84-32148

EQUATORIAL ELECTROJET
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3206-PRE/564] N84-31244
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733

EQUILIBRIUM FLOW
Efficient finite-difference calculation procedure for multi-dimensional fluid flows
[DE84-011710] N84-31577

EQUIPMENT SPECIFICATIONS
Improvement of the equipment of very long horizontal tensile test bench
[CETIM-5.510.05] N84-31724

EROSION
Empirical relations for cavitation and liquid impingement erosion processes
[NASA-TP-2339] N84-31349
Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces
[AD-A143041] N84-31355

ERROR ANALYSIS
Operational parameters of a 2.0-MeV RFQ linac
[DE84-011368] N84-31498
Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955
Fundamental research in applied mathematics
[AD-A143123] N84-32016

Sources of error in objective analysis
[AD-A142772] N84-32020
Asteroid light inversion
[NASA-CR-173864] N84-32316
ERROR CORRECTING CODES
Probability of undetected error after decoding for a concatenated coding scheme
[NASA-CR-173837] N84-31992
ERROR DETECTION CODES
J73AVS: A JOVIAL J73 automated verification system
[AD-P003521] N84-31125
ERRORS
Results of the first complete static calibration of the RSRA rotor-load-measurement system
[NASA-TP-2327] N84-31111
ERYTHROCYTES
Effects of whole-body cold exposure on erythrocyte morphology N84-31906
ESTIMATES
Compensating technique using one active control scheme to nullify the accumulated effect of modelling deviation
[INPE-3181-PRE/546] N84-31998
Asymptotic estimates for resolvents of some nonintegrable Volterra kernels
[AD-A141662] N84-31999
The use of double sampling in studying robustness
[AD-A142982] N84-32022
ESTIMATING
The use of double sampling in studying robustness
[AD-A142982] N84-32022
ETHERS
Kinetics of complexation of the macrocycles 18C6 and 12C4 ethers with LiAsF-6 in 1,2-dimethoxyethane at 25 deg C
[AD-A143066] N84-31304
ETHYLENE
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009987] N84-32215
EULER EQUATIONS OF MOTION
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551
Flux-vector splitting and Runge-Kutta methods for the Euler equations
[NASA-CR-172415] N84-31993
EUTECTIC ALLOYS
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
EUTECTIC COMPOSITES
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
EUTROPHICATION
Ten-year forecasts of water quality in Lake Michigan using a deterministic eutrophication model
[DE84-011425] N84-31804
EVALUATION
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-186655] N84-32301
EVAPORATION
Holographic investigation of thermal nonequilibrium vapor generation
[DE84-011905] N84-31607
EVAPORATION RATE
Determination of evaporation rates of organic solvents by thin-film evaporometer
[DE84-012308] N84-31313
EVAPORATIVE COOLING
A numerical simulation of heat transfer in evaporative cooling towers
[DE84-901142] N84-31580
EVOLUTION (DEVELOPMENT)
Origin and evolution of the West Philippine Basin N84-31620
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
EXCIMER LASERS
Optical coating materials for the ultraviolet: Selection and characterization
[DE84-011504] N84-31629
EXCITATION
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
Modal parameter estimation via shaker versus speaker excitation
[DE84-012897] N84-31223
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
The response of nonlinear structures to random excitation N84-31678
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32163
EXCITONS
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32063
EXERCISE PHYSIOLOGY
Psychophysics of proprioceptive sensibility N84-31933
EXHAUST GASES
Wall quench and flammability limit effects on exhaust hydrocarbon emission
[DE84-009754] N84-31307
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
Using gas-turbine power stations with aircraft engines for power-and-heat generation
[AD-A142084] N84-31786
Studies in atmospheric chemistry. Part 1: Primary peroxides from hydrocarbons. Part 2: elemental analysis using nuclear reactions
[DE84-012246] N84-31857
EXHAUST NOZZLES
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099
EXHAUST SYSTEMS
Compressed air exhaust silencers, summary
[CETIM-11-H-275] N84-31650
EXPERIMENT DESIGN
Test means and methods linked to experiments on systems — electromagnetic pulse effects
[SNIAS-841-422-110] N84-31506
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
EXPERT SYSTEMS
Computational aerodynamics and artificial intelligence
[NASA-TM-85994] N84-31069
EXPLOSIONS
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
EXPLOSIVE DEVICES
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
EXPLOSIVE FORMING
Investigation of shock activated sintering and shock wave consolidation of selected powder materials
[DE84-013074] N84-31391
EXPONENTIAL FUNCTIONS
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Exponential-fitted methods for integrating stiff systems of ordinary differential equations: Applications to homogeneous gas-phase chemical kinetics N84-31279
EXPOSURE
Effects of whole-body cold exposure on erythrocyte morphology N84-31906
EXTERNAL STORES
MIL-STD-1760 development program
[AD-P003526] N84-31130
Aircraft-store Electrical Interconnection System (AEIS) functional requirements
[AD-P003527] N84-31131
Signal set standardization for the aircraft-store electrical interconnection system
[AD-P003528] N84-31132
Consideration of MIL-STD-1760, aircraft/store electrical interface standard on stores management system architectures
[AD-P003529] N84-31133
Aircraft multiplexing system architecture and stores compatibility
[AD-P003530] N84-31134
EXTRATERRESTRIAL RADIATION
Theoretical models for the polarization of astronomical masers N84-32313
EYE (ANATOMY)
Correlation of afferent activity and binocular receptive field properties
[AD-A143087] N84-31936

F

F REGION
Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil
[INPE-3036-PRE/469] N84-31839
F-15 AIRCRAFT
Closing the gap between aircraft and simulator training with Limited Field-Of-View (LFOV) visual systems
[AD-P003448] N84-32225
F-16 AIRCRAFT
A common 1553B I/O channel for the F-16
[AD-P003546] N84-31150
Elements for successful implementation of computing standards
[AD-P003566] N84-31171
FABRICATION
Metal finishing and vacuum processes groups
[DE84-011046] N84-31358
Broadband cavity-backed slot using printed circuit technology
[AD-P003506] N84-31476
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
The study of efficient low-power diffraction designs
[NASA-CR-171142] N84-31598
Development of long-length wire filament strain gages
[DE84-011543] N84-31805
A study of the drawing process for optical fibers
[AD-A142930] N84-32171
FACTORIZATION
Element-by-element solution procedures for nonlinear structural analysis N84-31684
Usual initial and final state effects in quantum chromodynamics
[DE84-010422] N84-32148
FACULAE
The shape of the Sun N84-32334
FAILURE
Interdependence of equivalent steady stress, crack growth and failure on sequence and amplitude of irregular loading
[AD-A142951] N84-31707
FAILURE ANALYSIS
Failure analysis of plasma-sprayed thermal barrier coatings
[NASA-TM-83777] N84-31347
The 100 area diesel performance data
[DE84-011136] N84-31648
A method for the combination of stochastic time varying load effects N84-31989
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185
FAR FIELDS
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470
Conformal array analysis
[AD-P003504] N84-31472
FAR INFRARED RADIATION
Far infrared optical properties of WbSe3
[DE84-009223] N84-32173
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32328
FAR ULTRAVIOLET RADIATION
Results from Astron satellite after one year in orbit N84-31233
Theory of 4-wave mixing for VUV generation
[DE84-011663] N84-31630
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009696] N84-32199
FAST FOURIER TRANSFORMATIONS
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32128
FAST NEUTRONS
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions
[DE84-001300] N84-31359
Neutron damage effects in AlGaAs/GaAs solar cells
[DE84-009448] N84-31791
FATIGUE (BIOLOGY)
Ergonomic analysis of human operation of video terminal N84-31915
FATIGUE (MATERIALS)
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83776] N84-31348
Characterization of thermo-mechanical fatigue N84-31673
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
FATIGUE LIFE
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352

FATIGUE TESTING MACHINES
Improvement of the equipment of very long horizontal tensile test bench
[CETIM-5.510.05] N84-31724

FATIGUE TESTS
Calibration of CT-4A fatigue test article, March 1983
[AD-A142860] N84-31115
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading
[NASA-CR-3815] N84-31290
Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites
[SNIAS-841-551-102] N84-31298
Hydrogen fatigue test — plated bolts
[CETIM-12-F-400] N84-31373
Characterization of common steels. Report of partial test Number M8-645900, Number 4 N84-31376
Cyclic torsion testing
[NASA-TM-83756] N84-31687
How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704

FAULT TOLERANCE
Digital avionics design for validation
[AD-P003571] N84-31176
Reliability analysis of an ultra-reliable fault tolerant control system
[NASA-CR-166594] N84-31219
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955

FEASIBILITY ANALYSIS
Spacecraft servicing demonstration plan
[NASA-CR-171132] N84-31258
Link between characteristics of EEG rhythms in biofeedback control and indices for operator activity N84-31927
Future accelerators using micro-fabrication technology
[DE84-002692] N84-32157

FEDERAL BUDGETS
Guide to programs, fiscal year 1984: Guide describing National Science Foundation programs and activities
[PB84-193226] N84-32270
Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-189158] N84-32302

FEEDBACK
Feedback in separated flows over symmetric airfoils
[NASA-TM-83756] N84-31091
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31874
New type of dye laser with light-induced distributed feedback N84-32067
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338

FEEDBACK CIRCUITS
A wide field-of-view CRT projection system with optical feedback for self alignment
[AD-P003447] N84-32224

FEEDBACK CONTROL
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem
[NASA-CR-3828] N84-31217
Some aspects of guidance loop design for SAM systems N84-31251
Dielectric cure monitoring: Preliminary studies
[NASA-TM-86452] N84-31378
Automatic camera tracking for remote manipulators
[DE84-011455] N84-31608
Instrumentation for real-time ultrasonic sensing of arc welding characteristics
[DE84-012536] N84-31649

FEEDERS
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656

FEMALES
First mixed crew in space N84-31917
Anthropometric and mass distribution characteristics of the adult female, revised
[AD-A143066] N84-31939

FERMIONS
Numerical calculations in quantum field theories
[DE84-010692] N84-32217

FERRIMAGNETISM
Large-signal amplifier based on ferrimagnetic echo N84-31440

FERROMAGNETIC MATERIALS
Electromagnetic excitation of sound in metals N84-32082

FIBER COMPOSITES
Application of finite element substructuring to composite micromechanics
[NASA-TM-83729] N84-31288

FIBER OPTICS
Fiber optics for the future - wavelength division multiplexing
[AD-P003579] N84-31184
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
A study of the drawing process for optical fibers
[AD-A142930] N84-32171
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
[AD-A143142] N84-32172
A multi-GHz multi-channel photonic analog data processing system
[DE84-012261] N84-32175
Radiation effects in optoelectronic devices
[DE84-012689] N84-32176
Measurement of multimode optical fiber attenuation: An NBS special test service
[PB84-192202] N84-32179
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249

FIBER ORIENTATION
A new approach to the evaluation of the effects of stress state and interfacial properties on the behavior of advanced metal matrix composites
[AD-A143083] N84-31294

FIBER REINFORCED COMPOSITES
Single and multiple fiber models for fracture of fibrous composites N84-31286
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites
[AD-A142807] N84-31293
A shear deformable shell element for laminated composites N84-31691
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

FIBERS
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285
Dynamic overstresses in fibrous polymeric materials
[DE84-012605] N84-31394
Continuum theory for fiber suspensions
[DE84-012258] N84-31584
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709
Dependence of acoustic properties of sound absorbing fibrous materials on their structure N84-32044
A study of the drawing process for optical fibers
[AD-A142930] N84-32171
Measurement of multimode optical fiber attenuation: An NBS special test service
[PB84-192202] N84-32179

FIELD OF VIEW
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
A wide field-of-view CRT projection system with optical feedback for self alignment
[AD-P003447] N84-32224
Closing the gap between aircraft and simulator training with Limited Field-Of-View (LFOV) visual systems
[AD-P003448] N84-32225
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249

FIELD THEORY (PHYSICS)
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510

FIGHTER AIRCRAFT
Advanced cockpit-systems integration
[AD-P003569] N84-31174

FILAMENTS
Dynamic overstresses in fibrous polymeric materials
[DE84-012605] N84-31394
Development of long-length wire filament strain gages
[DE84-011543] N84-31605

FILE MAINTENANCE (COMPUTERS)
NIMBUS 7 Earth Radiation Budget (ERB) matrix user's guide. Volume 2: Tape specifications
[NASA-CR-170620] N84-31961

FILM THICKNESS
Use of surface and thin film analysis techniques to study metal-organic and metal-polymer interaction
[DE84-012542] N84-31321

FILMS
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038

FILTERS
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997

FILTRATION
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076

FINE STRUCTURE
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190

FINITE DIFFERENCE THEORY
Stall delay by boundary layer blowing and/or suction N84-31086
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551
Airblast simulations using flux-corrected transport codes
[AD-A142820] N84-31567
Efficient finite-difference calculation procedure for multi-dimensional fluid flows
[DE84-011710] N84-31577
Mathmatical modeling of longitudinal profile adjustment in alluvial streams N84-31726
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802
Calculating electric fields in semiconductor structures when singularities are present N84-32051
Time dependent wave envelope finite difference analysis of sound propagation
[NASA-TM-83744] N84-32118
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32126

FINITE ELEMENT METHOD
Application of finite element substructuring to composite micromechanics
[NASA-TM-83729] N84-31288
Calculation of low altitude electromagnetic pulses in the first moments — after a nuclear explosion
[SNIAS-841-422-105] N84-31503
Another attempt to overcome the bent element blues
[DE84-007785] N84-31571
Continuum theory for fiber suspensions
[DE84-012258] N84-31584
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668
The response of nonlinear structures to random excitation N84-31678
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31688
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
New variational formulations of hybrid stress elements N84-31690
A shear deformable shell element for laminated composites N84-31691
Nonlinear finite element analysis of shells with large aspect ratio N84-31692
Self-adaptive solution strategies N84-31693
Element-by-element solution procedures for nonlinear structural analysis N84-31694
Automatic finite element generators N84-31695
Stability and convergence of underintegrated finite element approximations N84-31696
Interactive finite elements for general engine dynamics analysis N84-31698
Slideline vertification for multilayer pressure vessel and piping analysis including tangential analysis
[DE84-004333] N84-31711
Combined experimental/analytical modeling using component mode synthesis
[DE84-013147] N84-31715
Extension of finite element programs to thermoelastoviscoplastic domains
[CETIM-11-A-102] N84-31716
DYNA3D user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1
[DE84-012828] N84-31979

FIRE CONTROL
Cost-effective and efficient maintenance training devices: A user accepted design process
[AD-P003456] N84-32233

FIRE FIGHTING
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886

FLAME PROPAGATION
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302

FLAME RETARDANTS
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011081] N84-31406

FLAMES
Stretch effects in plane premixed hydrogen-air flames
[DE84-012035] N84-31311
Density fluctuations in premixed turbulent flames
[DE84-012055] N84-31322
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323
Pressure effects on wall heat transfer during flame quenching
[DE84-012265] N84-31575

FLAMMABILITY
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323

FLAPS (CONTROL SURFACES)
Pitch control of a satellite using stabilizing flaps
[INPE-3185-PRE/550] N84-31246

FLAT PLATES
User's guide to Sphere and Plate Interactive Display Routine (SPIDR)
[DE84-012655] N84-31976

FLEXIBILITY
Multi-variate acceptance plans for flexible airport pavements N84-31220

FLEXIBLE BODIES
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173866] N84-31214

FLEXING
Double arch mirror study. Part 2: Engineering analysis report
[NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report
[NASA-CR-166589-PT-3] N84-31636
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668
Oscillations of elastic airplane due to wind gust N84-32087

FLIGHT CONTROL
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250

FLIGHT CREWS
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142946] N84-31948
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261

FLIGHT HAZARDS
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258

FLIGHT PATHS
Fuel conservative guidance concept for shipboard landing of powered-life aircraft
[NASA-TM-85971] N84-31215

FLIGHT PLANS
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104

FLIGHT SIMULATION
Simulated crash decelerations in a light aircraft cabin
[AD-A142606] N84-31102
Fuel conservative guidance concept for shipboard landing of powered-life aircraft
[NASA-TM-85971] N84-31215
Pilot oriented performance measurement
[AD-P003450] N84-32227
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261

FLIGHT SIMULATORS
Closing the gap between aircraft and simulator training with Limited Field-Of-View (LFOV) visual systems
[AD-P003448] N84-32225
Image generator architectures and features
[AD-P003449] N84-32226
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230
Concurrency of design criteria: A key to trainer readiness
[AD-P003454] N84-32231
Visual cueing effectiveness: Comparison of perception and flying performance
[AD-P003456] N84-32235
Managing aircraft/simulator concurrency
[AD-P003463] N84-32240
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003468] N84-32243
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258

FLIGHT TIME
Fuel conservative guidance concept for shipboard landing of powered-life aircraft
[NASA-TM-85971] N84-31215

FLIGHT TRAINING
Closing the gap between aircraft and simulator training with Limited Field-Of-View (LFOV) visual systems
[AD-P003448] N84-32225
Image generator architectures and features
[AD-P003449] N84-32226
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228

FLIR DETECTORS
LANTIRN (Low Altitude Navigation and Targeting Infrared System for Night) - tommorrow's software development today
[AD-P003563] N84-31188

FLOORS
Direct generation of seismic floor response spectra for classically and nonclassically damped structures
[PB84-191675] N84-31860

FLORIDA
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730
The neogene stratigraphy of the Central Florida Panhandle N84-31833

FLOW CHARACTERISTICS
Flow structures and their evolution in turbulent shear layer N84-32091
Motion of vortex pair between parallel walls N84-32092

FLOW DISTRIBUTION
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
Acoustic excitation: A promising new means of controlling shear layers
[NASA-TM-83772] N84-31096
Computational hierarchy for the analysis of combustion phenomena in ramjet environments N84-31277
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554
Nonstationary oblique-shock-wave reflections in air
[UTIAS-270] N84-31562
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830
Flow structures and their evolution in turbulent shear layer N84-32091

FLOW EQUATIONS
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Flowing effects in gas lasers
[AD-A141409] N84-31620

FLOW MEASUREMENT
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85983] N84-31094
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590
Expendable current profiler (XCP, Mod 7)
[AD-A142936] N84-31897

FLOW STABILITY
Hopf bifurcation in two-component flow
[AD-A142844] N84-31568
On the stability of boundary-induced flows and modons
[PREPRINT-372] N84-31591
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056

FLOW THEORY
Transition bifurcation branches in non-linear water waves
[CAR-8416] N84-31556

FLOW VELOCITY
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174636] N84-31595

FLOW VISUALIZATION
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-008550] N84-31579
Preliminary experiments on phase conjugation for flow visualization — barium titanate single crystals
[NASA-TM-83766] N84-32189

FLOWMETERS
Expendable current profiler (XCP, Mod 7)
[AD-A142936] N84-31897

FLUID BOUNDARIES
Finite-amplitude interfacial waves
[AD-A142767] N84-31849

FLUID DYNAMICS
Airblast simulations using flux-corrected transport codes
[AD-A142820] N84-31567
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32061

FLUID FILLED SHELLS
Free oscillations of ideal stratified fluid in container N84-32058

FLUID FILMS
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680

FLUID FLOW
A direct numerical method for the solution of unsteady Navier-Stokes equations in generalized orthogonal coordinates N84-31549
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31585
Hopf bifurcation in two-component flow
[AD-A142844] N84-31568
Efficient finite-difference calculation procedure for multi-dimensional fluid flows
[DE84-011710] N84-31577
Computer codes for fluid-structure interactions
[DE84-011068] N84-31578
Two years experience testing solar collectors in Brazil
[INPE-3221-RPE/461] N84-31785
Motion of vortex pair between parallel walls N84-32092

FLUID JETS
Supercritical and chromotography/supersonic jet spectroscopy
[DE84-012124] N84-31312

FLUID MECHANICS
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE84-008935] N84-31572

FLUIDIZED BED PROCESSORS
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784

FLUORESCENCE
Versatility of laser induced fluorescence line narrowing in chemical analysis
[DE84-012834] N84-31316
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405

FLUORIDES
Statistical-mechanical study of polyvinylidene fluoride
[AD-A143040] N84-31383

FLUOROCARBONS
Studies of new media radiation induced laser
[NASA-CR-173846] N84-31616

FLUX (RATE)
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336

FLUX DENSITY
Diffusion transfer during near-sonic turbulence N84-32090
Bremsstrahlung from longitudinal plasma waves produced by subthermal electrons in plasma N84-32102
Linear polarization and total flux density of silicon monoxide masers and active extragalactic objects at millimeter wavelengths N84-32314

FLY BY WIRE CONTROL
Application of JOVIAL (J-73) to digital flight controls
[AD-P003525] N84-31129
FOCUSING
Generation and application of finely focused low energy electron beams N84-32129
FOOD CHAIN
Activities in applied systems analysis N84-32026
FORBIDDEN TRANSITIONS
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32063
FORECASTING
Space transportation systems of the future N84-31235
Economics of hydrogen production: The next 25 years
[DE84-007279] N84-31414
Ten-year forecasts of water quality in Lake Michigan using a deterministic eutrophication model
[DE84-011425] N84-31604
FOREST MANAGEMENT
Long term policy planning concerning Harderbos (Netherlands)
[REPT-178] N84-31777
FORESTS
Habitability of the Earth N84-31740
Long term policy planning concerning Harderbos (Netherlands)
[REPT-178] N84-31777
FORGING
Forging and stamping nonferrous metals. Handbook
[AD-A141689] N84-31351
Automation of a drop forge at the Centre Techniques des Industries Mecaniques (CETIM) forge section
[CETIM-1.3K.27.3] N84-31423
Industrial forging applications of shaping simulation using modeling clay
[CETIM-1.3K.36.2] N84-31424
Construction of a test bench for closed die forging
[CETIM-5.560.50] N84-31425
Influence of choice of steel on forging
[CETIM-1.3K.32.1] N84-31663
Preliminary investigations of means to transfer computer programs to the forging industry
[CETIM-1.3K.38.2] N84-31963
FORMAT
WARN: A warning formatter
[PB84-204551] N84-31985
FORMATIONS
The neogene stratigraphy of the Central Florida Panhandle N84-31633
FOSSIL FUELS
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31674
Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction
[DE84-012079] N84-31679
FOSSILS
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31631
FOUNDATIONS
A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010978] N84-31797
FOURIER ANALYSIS
The use of overlapped subarray techniques in simultaneous receive beam linear arrays
[AD-P003501] N84-31469
Enhanced Fourier algorithms for ultrasonic crack characterization
[DE84-012544] N84-31714
FOURIER TRANSFORMATION
Convergence of bivariate cardinal interpolation
[AD-A142894] N84-32006
FRACTOGRAPHY
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy
[AD-A142069] N84-31702
FRACTURE MECHANICS
Failure analysis of plasma-sprayed thermal barrier coatings
[NASA-TM-83777] N84-31347
The effects of deformation mode and microstructure fracture-related properties of Ti alloys
[AD-A142991] N84-31353
Fracture mechanics formulas on microcomputers
[CETIM-100960] N84-31722
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31618
FRACTURE STRENGTH
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading
[NASA-CR-3815] N84-31290
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297
FRACTURES (MATERIALS)
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31686
Inelastic and dynamic fracture and stress analyses N84-31697
FRAMES
Strength and stiffness of AISC type 2 steel frames N84-31666
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667
FREDHOLM EQUATIONS
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018
FREE ELECTRON LASERS
Thomson backscattering from an intense relativistic electron beam as a diagnostic for a free electron laser
[AD-A143027] N84-31623
Short wavelength optics for future free electron lasers
[DE84-012316] N84-31626
FREE VIBRATION
Free oscillations of ideal stratified fluid in container N84-32056
FREQUENCY RESPONSE
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-173660] N84-31596
FREQUENCY SHIFT
Microwave phase modulators using semiconductor diodes (survey) N84-31448
FREQUENCY SHIFT KEYING
Performance of digital communications over selective fading channels N84-31456
FRICTION
Transfer during sliding wear of selected metal systems N84-31341
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
Radial SI latches vibration test data review
[NASA-TM-86454] N84-31638
Automotive Stirling engine development program
[NASA-CR-174622] N84-32305
FRICTION MEASUREMENT
Coefficient of surface friction with turbulent flow in boundary layer N84-32064
FRICTION REDUCTION
Lubrication of machine elements
[NASA-RP-1126] N84-31640
FROST
Comparative study of heat pump regulation systems. The problem of defrosting evaporators
[CETIM-100250] N84-31589
FUEL CELLS
Technology base research project for electrochemical energy storage
[DE84-012248] N84-31535
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544
FUEL CONSUMPTION
Feasibility study of a low cost Energy Performance Management System (EPMS) — automatic flight control
[BMFT-FB-W-84-015] N84-31116
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215
FUELS
Research and development of alcohol fuel usage in spark ignited engines
[DE84-011177] N84-31412
FUNCTIONAL DESIGN SPECIFICATIONS
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
FUNCTIONS (MATHEMATICS)
Upper bounds for the numbers of solutions of diophantine equations
[MATH-CENTRE-TRACTS-168] N84-32019
Sequential method of minimizing nonlinear function on simplex N84-32080
FURANS
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218
FUSELAGES
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114
Oscillations of elastic airplane due to wind gust N84-32067
FUSION REACTORS
Perspective of the corrosive behavior of lithium and sodium
[DE84-011635] N84-31362
START/TM: A study of start-up and fractional power operation of tandem mirror fusion reactors
[DE84-011477] N84-32196
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198
FUZZY SETS
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31998

G

GALACTIC EVOLUTION
Galactic cycles and their relationship to life on Earth
[DE84-011737] N84-32329
Three-dimensional model for fusion processes
[DE84-011731] N84-32339
GALACTIC NUCLEI
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32336
Three-dimensional model for fusion processes
[DE84-011731] N84-32339
GALACTIC STRUCTURE
Galactic cycles and their relationship to life on Earth
[DE84-011737] N84-32329
GALILEO SPACECRAFT
Attitude dynamics of the Galileo spacecraft N84-31262
GALLIUM ARSENIDES
Neutron damage effects in AlGaAs/GaAs solar cells
[DE84-009448] N84-31791
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-008034] N84-32208
GAMMA RAY BURSTS
Two probable optical flashes from gamma-ray bursters
[NASA-TM-86126] N84-32337
GAMMA RAY SPECTRA
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31783
GAMMA RAYS
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
GAS DISCHARGE TUBES
Cold-cathode gas-discharge modulator power tube N84-31443
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536
GAS DYNAMICS
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
Time dependent wave envelope finite difference analysis of sound propagation
[NASA-TM-83744] N84-32118
GAS FLOW
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101
Flow in a tapered centrifuge
[DE84-012553] N84-31573
Flowing effects in gas lasers
[AD-A141409] N84-31620
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32088
Micrometric cleaning of steel tubes through ultrasonic cavitation
[REPT-61584] N84-32125

Dual arc penning ion source gas flow experiments
[DE84-011637] N84-32151

GAS GENERATORS
Porous catalytic metal plate degeneration bed in a gas generator
[AD-D011078] N84-31407
Producer gas: Another fuel for motor transport
[DE84-901066] N84-31416
Development, test and delivery of solid propellant generators for inflation of PFD's
[AD-A1300477] N84-31946

GAS INJECTION
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32083

GAS IONIZATION
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy
[DE84-011638] N84-31320
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065

GAS JETS
Propagation of gas jet in liquid N84-32057

GAS LASERS
Flowing effects in gas lasers
[AD-A141409] N84-31620
Waveguide CO2 laser with 7.5 W power rating N84-32096

GAS MIXTURES
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065

GAS TURBINE ENGINES
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31688
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Three-dimensional stress analysis using the boundary element method N84-31700
Using gas-turbine power stations with aircraft engines for power-and-heat generation
[AD-A142084] N84-31786

GAS TURBINES
Increase of efficiency in cooled high temperature turbines
[BMFT-FB-W-84-019] N84-31212
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784

GAS-SOLID INTERFACES
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31580

GASEOUS DIFFUSION
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101

GASES
On waves in nonadiabatic and nonequilibrium gases
[AD-A141450] N84-31465
Global solutions for the one-dimensional equations of a viscous reactive gas
[AD-A142931] N84-31569

GAUGE THEORY
Theoretical high energy physics
[DE84-011654] N84-32153

GAUSS EQUATION
Strong confidence intervals: A compromise between the Gaussian and the slash
[AD-A142981] N84-32021

GAUZE
Liquid flow through mesh-wire gauze wicks — models
[NLR-TR-83104-U] N84-31592

GEOCHEMISTRY
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31728
Water geochemistry of hydrothermal systems, Wood River District, Idaho
[DE84-012190] N84-31769
Geology and geochemistry of the Arctic prospect, Ambler District, Alaska N84-31814
Geochemistry of oil shale leachates and interaction with geologic substrates, Picsance Creek Basin, Colorado N84-31825
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential
[DE84-012404] N84-31852

GEOCHRONOLOGY
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[E84-10189] N84-31760
Geology of the Portrerillos District, Atacama, Chile N84-31811
Geochronology, paleomagnetism and petrology of the Upper Cenozoic Brunesu Formation in the Western Snake River Plain, Idaho N84-31826
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828
The neogene stratigraphy of the Central Florida Panhandle N84-31833
Geology of the Guslan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834

GEODESY
Space research in Pakistan: A relentless pursuit N84-31227
Geodetic graphs and convexity N84-31729
Geodesy for the layman
[AD-A142764] N84-31766

GEODETIC COORDINATES
Geodesy for the layman
[AD-A142764] N84-31766

GEODETIC SURVEYS
African Doppler Surveys (ADOS)
[AD-A142738] N84-31764

GEOGRAPHY
Advanced data structure and geographic information systems N84-31742
Knowledge based engineering for spatial database management and use N84-31745

GEOIDS
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736

GEOLOGICAL FAULTS
Geology of the Portrerillos District, Atacama, Chile N84-31811
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845

GEOLOGICAL SURVEYS
Low temperature geothermal resource evaluation of the Moses Lake-Ritzville-Connell area, Washington
[DE84-012506] N84-31773
Origin and evolution of the West Philippine Basin N84-31820
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845

GEOLOGY
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range
[DE84-012545] N84-31771
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 — Michigan, Wisconsin, and Minnesota
[DE84-012682] N84-31775
Lineaments of Texas: Possible surface expressions of deep-seated phenomena
[DE84-010827] N84-31858
Seismological studies of the continental lithosphere
[PB84-194752] N84-31862

GEOMAGNETISM
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
Effects of climate on kininogen levels in healthy human subjects N84-31907
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930

GEOMETRIC ACCURACY
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
Investigation of LANDSAT D Thematic Mapper geometric performance: Line to line and band to band registration — Toulouse, France and Mississippi, U.S.A.
[E84-10187] N84-31758

GEOMETRIC RECTIFICATION (IMAGERY)
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754

GEOMETRY
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110

GEOMORPHOLOGY
Mathmatical modeling of longitudinal profile adjustment in alluvial streams N84-31726
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
Geology of the Portrerillos District, Atacama, Chile N84-31811
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830
Geology of the Guslan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation
[CSIR-TRANS-1726] N84-31842

GEOPHYSICS
Global resources information system N84-31747
Marine Seismic System (MSS) deployment. Phase II: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean
[AD-A142873] N84-31850
Deep-Towed Array Geophysical System (DTAGS): A hardware description
[AD-A142970] N84-31851
Complete Bouguer gravity anomaly map, Cascade Mountains, Washington
[DE84-012548] N84-31856
Environmental Research Laboratories publication abstracts, FY 1983
[PB84-189323] N84-31892

GEOSTROPHIC WIND
Surface winds in some Alaskan passes
[PB84-194745] N84-31895

GEOSYNCHRONOUS ORBITS
Optimal low-thrust transfers to geosynchronous orbit N84-31240

GEOTHERMAL RESOURCES
Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada
[DE84-012409] N84-31770
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range
[DE84-012545] N84-31771
Low temperature geothermal resource evaluation of the Moses Lake-Ritzville-Connell area, Washington
[DE84-012505] N84-31773
Results of a detailed gravity survey in the Alamosa area, Alamosa County, Colorado
[DE84-012188] N84-31853
Temperature profiles from Salt Valley, Utah
[DE84-900996] N84-31854
Lineaments of Texas: Possible surface expressions of deep-seated phenomena
[DE84-010827] N84-31858

GEOTHERMAL TECHNOLOGY
State of technology of direct contact heat exchanging
[DE84-012824] N84-31585

GERMANIUM
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083

GERMANIUM ALLOYS
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure
[DE84-012395] N84-31361

GLASS
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
Double arch mirror study
[NASA-CR-166589] N84-31637
Newly discovered effect of interaction of optical radiation and glass N84-32069

GLASS COATINGS
Investigations of mechanical properties of high strength steels and their suitability for glass lining
[BMFT-FB-T-84-076] N84-31370

GLASS ELECTRODES
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539

GLASS FIBER REINFORCED PLASTICS
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
Nuclear Magnetic Resonance (NMR) study of glass fiber-epoxy resin composites in the solid state N84-31299

GLASS LASERS
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
Diagnostics for an XUV/soft X-ray laser
[DE84-012593] N84-31628

GLOBAL AIR SAMPLING PROGRAM
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31665
GLOW DISCHARGES
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
GLUES
Creep of six glues
[CETIM-1.3N.16.2] N84-31398
GOLD COATINGS
Adhesion between polymers and evaporated gold and nickel films
[NASA-TP-2360] N84-31379
GONIOMETERS
In situ goniometer
[CETIM-5.41.22.0] N84-31609
GOVERNMENT PROCUREMENT
MIL-STD defense system software development
[AD-P003580] N84-31195
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
Effectiveness of multi-year and advance procurement contracts
[AD-P003462] N84-32239
Managing aircraft/simulator concurrency
[AD-P003463] N84-32240
The Program Planning Review (PPR): Milestone or millstone?
[AD-P003460] N84-32259
GOVERNMENT/INDUSTRY RELATIONS
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266
GOVERNMENTS
Guide to programs, fiscal year 1984: Guide describing National Science Foundation programs and activities
[PB84-193226] N84-32270
Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-186153] N84-32302
EPA (Environmental Protection Agency) journal holdings report, 1983
[PB84-194577] N84-32304
GRAIN BOUNDARIES
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics
[DE84-011786] N84-31392
GRANULAR MATERIALS
Wear behaviour of steel under the action of granular interfacial minerals
[BLL-CE-TRANS-6002-(6022.09)] N84-31336
GRAPH THEORY
Geodetic graphs and convexity N84-31729
On the uniqueness of a regular thin near octagon on 256 vertices (or the semiplane belonging to the Mathieu group M12)
[MC-ZW-196/83] N84-32029
An infinite series of symmetric designs
[MC-ZW-202/83] N84-32031
GRAPHIC ARTS
The effect of information display format on multiple-cue judgment
[AD-A142884] N84-31941
GRAPHITE-EPOXY COMPOSITES
Characterization and degradation studies on synthetic polymers for aerospace application
[NASA-CR-166597] N84-31284
Fracto-emission from graphite/epoxy composites
[NASA-CR-173845] N84-31291
GRAPHS (CHARTS)
Geodetic graphs and convexity N84-31729
GRASSLANDS
Habitability of the Earth N84-31740
GRATINGS (SPECTRA)
Measurement of integrated circuit element dimensions taking into account real etching profile according to diffraction pattern N84-31437
Dielectric-grating band-pass filters N84-31442
Investigation of Bragg reflection of electromagnetic surface waves by diffraction grating N84-32063
GRAVIMETRY
Analysis of moisture in solids: A review of the last decade or from Pande to the present
[DE84-011166] N84-31326
Observations of long-period motions of the Earth at the South Pole N84-31823
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112
GRAVITATION
Results of a detailed gravity survey in the Alamosa area, Alamosa County, Colorado
[DE84-012188] N84-31653
Three-dimensional computer model for the atmospheric general circulation experiment
[NASA-CR-171109] N84-31663
GRAVITATIONAL EFFECTS
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171117] N84-31835
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171116] N84-31836
Development of a global model for atmospheric backscatter at CO2 wavelengths
[NASA-CR-171127] N84-31837
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58282] N84-31935
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312
GRAVITY ANOMALIES
Nonlinear inverse methods applied to interpreting gravity anomalies produced by multi-interfaced geologic bodies N84-31822
Complete Bouguer gravity anomaly map, Cascade Mountains, Washington
[DE84-012548] N84-31656
GRAVITY PROBE B
Helium thruster propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
GRAVITY WAVES
Transition bifurcation branches in non-linear water waves
[CAR-8418] N84-31556
Finite-amplitude interfacial waves
[AD-A142767] N84-31849
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331
GREENLAND
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
GRINDING (MATERIAL REMOVAL)
Grinding with Borazon: Progress and rewards
[CSIR-TRANS-1718] N84-31420
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology
[BMFT-FB-T-84-094] N84-32178
GRINDING MACHINES
Internal grinding of high-speed steels: Shorter processing times with boron nitride grinding tools
[CSIR-TRANS-1719] N84-31421
GROOVES
Laser window with annular grooves for thermal isolation
[DE84-011114] N84-31625
GROUND TRUTH
Habitability of the Earth N84-31740
GROUND WATER
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31726
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825
GROUP THEORY
An infinite series of symmetric designs
[MC-ZW-202/83] N84-32031
GUATEMALA
Geology of the Guatan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
GUIDANCE (MOTION)
A new concept for guiding missiles with an application to the ground-air system N84-31253
Homing head imperfections altering missile guidance N84-31256
GUIDANCE SENSORS
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
GULF OF MEXICO
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
GULF STREAM
South Atlantic physical oceanography study (year 5). Volume 1: Executive summary
[PB84-187855] N84-31899
GYROSTABILIZERS
Differential equations for movement of triaxial gyroscopic stabilizer on moving base N84-32107

H

HAFNIUM OXIDES
Recent damage results for antireflection coatings at 355 NM
[DE84-011560] N84-31388
HAMILTONIAN FUNCTIONS
Motion of vortex pair between parallel walls N84-32092
HANDBOOKS
Weibull analysis handbook
[AD-A143100] N84-32023
Guide to programs, fiscal year 1984: Guide describing National Science Foundation programs and activities
[PB84-193226] N84-32270
HARDNESS
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
HARMONIC ANALYSIS
Analytical model of the structureborne interior noise induced by a propeller wake
[NASA-CR-172361] N84-32119
HARMONIC FUNCTIONS
Hyperharmonic cones and hyperharmonic morphisms
[ISBN-951-41-0478-5] N84-32027
HARMONIC MOTION
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112
HARMONICS
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142840] N84-31100
Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
HARTREE APPROXIMATION
Current status of calculations and measurements of ion stopping power in ICF plasmas
[DE84-005860] N84-32187
HCN LASERS
Multifrequency emission from submillimeter lasers N84-32096
HEART RATE
Heart rhythm changes in response to sensorimotor load of varying complexity N84-31908
HEAT ACCLIMATIZATION
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931
HEAT EXCHANGERS
Ceramic heat exchanger design methodology
[DE84-010581] N84-31385
State of technology of direct contact heat exchanging
[DE84-012824] N84-31585
HEAT MEASUREMENT
A combined thermodynamic study of nickel-base alloys
[DE84-013467] N84-31368
Calorimetric and thermogravimetric analysis applied to industrial polymers
[SNIAS-841-551-101] N84-31399
HEAT OF DISSOCIATION
Survey and assessment of heat of reaction type chemical heat pumps
[DE84-010966] N84-31576
HEAT PIPES
Power flattening techniques for radioisotopic thermoelectric generators
[AD-A142937] N84-31520
Heat pipe technology development for high temperature space radiator applications
[DE84-012444] N84-31581
Two-dimensional vapor flow analysis in heat pipes
[DE84-012561] N84-31582
Heat pipe development status
[DE84-012580] N84-31583
HEAT PUMPS
Laboratory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment
[PB84-182146] N84-31426
Survey and assessment of heat of reaction type chemical heat pumps
[DE84-010966] N84-31576
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31586

Comparative study of heat pump regulation systems. The problem of defrosting evaporators
[CETIM-100250] N84-31589

HEAT RADIATORS
Heat pipe technology development for high temperature space radiator applications
[DE84-012444] N84-31581

HEAT RESISTANT ALLOYS
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys
[NASA-CR-173865] N84-31350
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31690
Refractory alloy technology for space nuclear power applications
[DE84-001745] N84-32166

HEAT SHIELDING
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561

HEAT TRANSFER
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561
Pressure effects on wall heat transfer during flame quenching
[DE84-012265] N84-31575
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-006550] N84-31579
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31586
Noncontradictory method of calculating radiation transfer, and problem of shock wave structure N84-32060
Engineering basis for selection of positron source material
[DE84-011772] N84-32143

HEAT TREATMENT
Development of improved low-strain creep strength in Cabot alloy R-41 sheet — nickel base sheet alloy for reentry shielding
[NASA-CR-172392] N84-31346
A combined thermodynamic study of nickel-base alloys
[DE84-013467] N84-31368
Improving comfort of welders by reducing preheating temperatures — steel welding
[CETIM-12-Y-413] N84-31651
Influence of choice of steel on forging
[CETIM-1.3K.32.1] N84-31663

HEATING
New approaches to photothermal spectroscopy
[DE84-009237] N84-31310

HEATING EQUIPMENT
Laborstory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment
[PB84-182146] N84-31426

HEAVY IONS
Beam experiment programs in the USA
[DE84-010604] N84-32138
Electromagnetic dissociation of radioactive heavy-ion beams
[DE84-012286] N84-32146
Concept of a superconducting linac for low-velocity ions
[DE84-011740] N84-32154

HEAVY LIFT AIRSHIPS
Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion
[NASA-CR-3822] N84-31216

HEAVY LIFT HELICOPTERS
Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion
[NASA-CR-3822] N84-31216

HEIGHT
Variability in the height distribution of electrojet currents of Jicamarca
[INPE-3205-PRE/563] N84-31840

HELICOPTER ENGINES
Advanced system for testing new helicopter transmissions N84-31120
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study
[AD-A143104] N84-31211

HELICOPTER PERFORMANCE
Advanced system for testing new helicopter transmissions N84-31120

HELICOPTERS
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
Advanced system for testing new helicopter transmissions N84-31120
Concepts for LHX avionics
[AD-P003575] N84-31180
Reliability analysis of an ultra-reliable fault tolerant control system
[NASA-CR-166594] N84-31219

HELIUM
Helium thruster propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195

HELIUM IONS
Electron capture cross sections in high energy He2+ + neutral Li collisions
[IPPJ-679] N84-32182

HELIUM ISOTOPES
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160

HELIUM-NEON LASERS
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922

HELMET MOUNTED DISPLAYS
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249

HEMATOLOGY
Effects of microwaves on cell membrane permeability
[AD-A142979] N84-31913

HEMODYNAMIC RESPONSES
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930

HEMODYNAMICS
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925

HEMOGLOBIN
Effects of radiofrequency radiation on differentiation of erythroleukemic cells
[AD-A143038] N84-31914

HETEROJUNCTIONS
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-006034] N84-32208

HEURISTIC METHODS
Multi-variate acceptance plans for flexible airport pavements N84-31220
Computer aided ultrasonic testing
[CETIM-15-H-404] N84-31661
A physical database design methodology using the property of separability N84-32281

HF LASERS
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142965] N84-31622

HIERARCHIES
Continuation of research in computer simulation of integrated circuits
[AD-A143005] N84-31970
One method of assessing the validity of organizational-systems modelling
[BLL-M-35805-(5828.4)] N84-32222

HIGH ALTITUDE
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597

HIGH CURRENT
Longitudinal and transverse instabilities in a high current modified betatron electron accelerator
[AD-A142822] N84-32132

HIGH ENERGY INTERACTIONS
Theoretical high energy physics
[DE84-011854] N84-32153

HIGH FREQUENCIES
Realization of high-frequency filters according to theory of guided spherical waves N84-31438
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode
[CRC-1375] N84-31458
Waveguide CO2 laser with 7.5 W power rating N84-32098

HIGH LEVEL LANGUAGES
The evolution of the JOVIAL/J73 language from definition to use
[AD-P003518] N84-31122
J73AVS: A JOVIAL J73 automated verification system
[AD-P003521] N84-31125
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
Feasibility assessment of JOVIAL to Ada (Trademark) translation
[AD-P003523] N84-31127
Application of JOVIAL (J-73) to digital flight controls
[AD-P003525] N84-31129
The NEBULA and MCF (Military Computer Family) standardization programs
[AD-P003531] N84-31135
The impact of NEBULA, MCF (Military Computer Family), and Ada (Trademark) on real-time embedded computer systems
[AD-P003534] N84-31138
PAS/NEB: A PASCAL language tool for the MCF (Military Computer Family)
[AD-P003535] N84-31139
Ada (Trademark) as a program design language. A rational approach to transitioning industry to the world of Ada through a program design language criteria
[AD-P003556] N84-31160
The KAPSE (Kernel Ada (Trademark) Programming Support Environment) interface team
[AD-P003557] N84-31161
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206

HIGH PRESSURE
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923

HIGH RESOLUTION
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules
[AD-A143017] N84-31303
Source of optical pumping for high-resolution spectroscopy with semiconductor laser N84-32070
Synthetic aperture radar simulation
[AD-P003474] N84-32246
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321

HIGH SPEED
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369

HIGH STRENGTH STEELS
Investigations of mechanical properties of high strength steels and their suitability for glass lining
[BMFT-FB-T-84-076] N84-31370
Characterization of common steels. Report of partial test Number M6-645900, Number 4 N84-31376

HIGH TEMPERATURE
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285
Use of pulse radiolysis to measure high temperature kinetics
[DE84-011702] N84-31324
Environmentally-controlled crack growth rate of type 304 stainless steel in high temperature sulfate solutions N84-31342
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion
[DE84-012386] N84-31363
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics
[DE84-011786] N84-31392
Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
Shock-initiated decomposition of nitramines with laser diagnostics
[DE84-011401] N84-31401
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 296-1300 deg K N84-31405
Heat pipe technology development for high temperature space radiator applications
[DE84-012444] N84-31581

HIGH TEMPERATURE PLASMAS
Electron capture cross sections in high energy He2+ -/+ neutral Li collisions
[IPPJ-679] N84-32182
Protective plasma envelope
[DE84-013316] N84-32194
HIGH TEMPERATURE TESTS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
Heat pipe development status
[DE84-012560] N84-31583
HIGH VOLTAGES
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511
HIGHWAYS
USSR report: Transportation
[JPRS-UTR-84-024] N84-31119
HISTORIES
Historical survey of resonance ionization spectroscopy
[DE84-011654] N84-31319
The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815
HODOGRAPHS
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31096
HOLDERS
Field ion microscopy and spectroscopy of hydrogen in metals
[DE84-012972] N84-31366
HOLE GEOMETRY (MECHANICS)
The hole drilling method for residual stress distribution measurement
[CETIM-100730] N84-31720
HOLOGRAPHIC INTERFEROMETRY
Holographic test procedures for the evaluation of complicated material composites (tires)
[BMFT-FB-T-84-096] N84-31612
HOLOGRAPHY
Holographic investigation of thermal nonequilibrium vapor generation
[DE84-011905] N84-31607
New type of dye laser with light-induced distributed feedback N84-32067
Apparatus based on holographic focusing diffraction grating for measurement of diffraction efficiency of three-dimensional image holograms N84-32068
HOMING DEVICES
Seeker systems simulation, present capability and future technology N84-31254
Homing head imperfections altering missile guidance N84-31256
HORN ANTENNAS
Hoop/column antenna: RF verification model. Volume 1: Test results
[NASA-CR-172412] N84-31463
HOT CORROSION
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
HOT PRESSING
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297
HOT STARS
Study of variable extinction of hot stars with circumstellar dust shells
[NASA-CR-173644] N84-32315
HTPB PROPELLANTS
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011061] N84-31406
HUBBLE SPACE TELESCOPE
Analysis of space telescope data collection systems
[NASA-CR-171129] N84-31958
HUMAN BEHAVIOR
Stability of physiological and psychological human functions under extreme environmental conditions N84-31910
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
European scientific notes, volume 38, no. 5
[AD-A141713] N84-32285
HUMAN BEINGS
Sensitivity to hypoxia in humans N84-31934
HUMAN BODY
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142948] N84-31948
HUMAN FACTORS ENGINEERING
Simulated crash decelerations in a light aircraft cabin
[AD-A142806] N84-31102
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation
[JPRS-UNE-84-001] N84-31903
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-012] N84-31916
Ergonomic analysis of human operation of video terminal N84-31918
Realization of human work capacity: Interdisciplinary problems N84-31920
Stress in work N84-31921
Teleoperator human factors study
[NASA-CR-171120] N84-31944
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142948] N84-31948
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
User-friendly software: The role of the user
[AD-P003489] N84-32256
HUMAN PERFORMANCE
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
Psychophysiological aspects of monotonous human activity N84-31911
Stress in work N84-31921
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31927
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
The effect of information display format on multiple-cue judgment
[AD-A142884] N84-31941
Variability of practice and the transfer of training of motor skills
[AD-A142896] N84-31942
The discrimination of pitch in pulse trains and speech
[AD-A142998] N84-32127
The user's mental model of an information retrieval system: Effects on performance N84-32275
HUMAN REACTIONS
Medical research in first 100 days of Salyut-7 flight N84-31230
HUMIDITY
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011695] N84-31874
HURRICANES
A computer calculation and display station for slosh hurricane surge model data
[PB84-196753] N84-31887
National Hurricane Operations Plan
[PB84-196837] N84-31888
HYBRID CIRCUITS
MIL-STD-1553 interface application notes
[AD-P003539] N84-31143
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208
HYBRID STRUCTURES
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
HYDRATES
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013086] N84-31328
HYDRATION
Age-related responses to de- and hyperhydration N84-31905
HYDRAULIC EQUIPMENT
Test rig for measuring hydraulic equipment noise
[CETIM-41-H-337] N84-31224
HYDROCARBONS
Wall quench and flammability limit effects on exhaust hydrocarbon emission
[DE84-009754] N84-31307
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
Lineaments of Texas: Possible surface expressions of deep-seated phenomena
[DE84-010827] N84-31858
HYDROGEN
Stretch effects in plane premixed hydrogen-air flames
[DE84-012035] N84-31311
Hydrogen transport, mixing, and combustion studies
[DE84-012455] N84-31317
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323
Microstructural studies of hydrogen and deuterium in BCC refractory metals
[DE84-011506] N84-31357
Hydrogen fatigue test — plated bolts
[CETIM-12-F-400] N84-31373
Crack kinetics of the nickel-hydrogen system N84-31665
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040
Heat transfer by radiation in hydrogen plasma N84-32106
HYDROGEN IONS
Field ion microscopy and spectroscopy of hydrogen in metals
[DE84-012972] N84-31366
Pulsed high-current source of negatively charged hydrogen ions
[DE84-012989] N84-32158
HYDROGEN ISOTOPES
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160
HYDROGEN PEROXIDE
Studies in atmospheric chemistry. Part 1: Primary peroxides from hydrocarbons. Part 2: elemental analysis using nuclear reactions
[DE84-012246] N84-31857
HYDROGEN PLASMA
Protective plasma envelope
[DE84-013316] N84-32194
HYDROGEN PRODUCTION
Activities at the Brookhaven National Laboratory integrated test bed for advanced hydrogen technology
[DE84-010226] N84-31409
Water vapor electrolysis: Systems considerations and cost/performance benefits
[DE84-007389] N84-31410
Rationale for US DOE energy storage program in hydrogen technology
[DE84-010225] N84-31411
Economics of hydrogen production: The next 25 years
[DE84-007279] N84-31414
HYDROGENATION
Mechanistic studies of catalytic methanol synthesis
[DE84-006380] N84-31308
Crystallite size and support effects on CO hydrogenation reactions
[DE84-012474] N84-31314
Study of the kinetics of hydrogenation using aged catalysis
[DE84-006588] N84-31330
IUE observations of variable type I Seyfert galaxies N84-31781
HYDROGEOLOGY
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31726
Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada
[DE84-012409] N84-31770
Geology hydrology and mineral resources of crystaline rock areas of Northeastern US
[DE84-013671] N84-31774
Geology of the Portrerillos District, Atacama, Chile N84-31811
Response of alluvial rivers to active tectonics N84-31812
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825
HYDROLOGY
Phase modulator in 41.850 MHz
[INPE-3177-PRE/544] N84-31515
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 — Michigan, Wisconsin, and Minnesota
[DE84-012682] N84-31775

Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802

HYDROLOGY MODELS
A method to combine remotely sensed and in situ measurements: Program documentation
[E84-10172] N84-31735

HYDROMETEOROLOGY
Measurements inside Oklahoma thunderstorms
[PB84-206911] N84-31891

HYDROSTATICS
Computation of the fluid-borne noise in hydrostatic systems and ways to decrease it
[BMFT-FB-HA-84-023] N84-31593

HYDROTHERMAL SYSTEMS
Water geochemistry of hydrothermal systems, Wood River District, Idaho
[DE84-012190] N84-31769
Argillic alteration associated with the Amethyst Vein System, Creede Mining District, Colorado N84-31832

HYDROXYL RADICALS
Temperature dependence of the Raman OH-streiching overtone from liquid water
[AD-A143131] N84-31305

HYPERSONIC FLOW
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86280] N84-31560
Hypersonic three-dimensional flow of radiating gas around wing N84-32062
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063

HYPERTHERMIA
Effect of body temperature on human work capacity N84-31926
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931

HYPOKINESIA
Hypokinesia experiment studies effects of weightlessness N84-31234
First mixed crew in space N84-31917

HYPOTHERMIA
Effects of whole-body cold exposure on erythrocyte morphology N84-31906

HYPOXIA
Sensitivity to hypoxia in humans N84-31934

HYSTERESIS
Results of the first complete static calibration of the RSRA rotor-load-measurement system
[NASA-TP-2327] N84-31111

I

ICE ENVIRONMENTS
Polar research board report, 1983 and future plans
[PB84-194315] N84-31779

IDAHO
Water geochemistry of hydrothermal systems, Wood River District, Idaho
[DE84-012190] N84-31769

IDEAL FLUIDS
Free oscillations of ideal stratified fluid in container N84-32058

IDENTIFYING
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185

IGNEOUS ROCKS
Geology hydrology and mineral resources of crystaline rock areas of Northeastern US
[DE84-013671] N84-31774
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831

IGNITION SYSTEMS
Wall quench and flammability limit effects on exhaust hydrocarbon emission
[DE84-009754] N84-31307

ILLINOIS
Petrography and depositional environment of the Herrin (no. 6) seam in central, eastern and northwestern Illinois N84-31613

IMAGE ANALYSIS
Investigation of LANDSAT D Thematic Mapper geometric performance: Line to line and band to band registration — Toulouse, France and Mississippi, U.S.A.
[E84-10187] N84-31758
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation — San Matteo Bridge and Stockton, California
[E84-10188] N84-31759
Modular image analysis system
[BMFT-FB-T-84-074] N84-32177

IMAGE ENHANCEMENT
A fast method for computer image enhancement
[INPE-3170-PRE/540] N84-31965

IMAGE MOTION COMPENSATION
Reflight certification software design specifications
[NASA-CR-171138] N84-31966

IMAGE PROCESSING
Development of a device for evaluation of interferograms
[BMFT-FB-T-84-097] N84-31613
Laser color recording unit
[BMFT-FB-T-84-098] N84-31633
Enhanced Fourier algorithms for ultrasonic crack characterization
[DE84-012544] N84-31714
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting
[E84-10176] N84-31738
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
Knowledge-based expert systems for crop identification N84-31744
The potential of AI techniques for remote sensing N84-31748
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10186] N84-31757
Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31762
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging
[DE84-010712] N84-32137
Modular image analysis system
[BMFT-FB-T-84-074] N84-32177
Image generator architectures and features
[AD-P003449] N84-32226

IMAGE RESOLUTION
Knowledge-based expert systems for crop identification N84-31744
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32168

IMAGERY
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247

IMAGES
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32168
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training
[AD-P003481] N84-32248

IMAGING TECHNIQUES
Seeker systems simulation, present capability and future technology N84-31254
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
Knowledge-based expert systems for crop identification N84-31744
The potential of AI techniques for remote sensing N84-31748
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31864
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
Theory of acoustic speckle N84-32114

IMPACT DAMAGE
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites
[AD-A142807] N84-31293
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31666

IMPACT TESTS
Characterization of common steels. Report of partial test Number M6-645900, Number 4 N84-31376

IMPREGNATING
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012867] N84-31309

IMPURITIES
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31448
Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-008855] N84-32191
Protective plasma envelope
[DE84-013316] N84-32194
Magnetic impurity scattering in in situ superconductors
[DE84-012835] N84-32212

INCIDENCE
Axial-conductances angular filter investigation
[AD-A142902] N84-31487

INCIDENT RADIATION
Focusers of obliquely incident laser radiation N84-32099

INCLUSIONS
X-ray diffraction study of the phase composition of the crystallization medium and inclusions in synthetic diamonds
[CSIR-TRANS-1723] N84-32203

INCOMPRESSIBLE FLOW
Computational fluid mechanics utilizing the variational principle of modeling damping seals
[NASA-CR-171114] N84-31553
Another look at the use of complex sources for the generation of bodies of revolution in incompressible flow
[CAR-8412] N84-31555
Numerical solution of viscoplastic flow problems by augmented lagrangians
[AD-A142793] N84-31566
Another attempt to overcome the bent element blues
[DE84-007785] N84-31571

INCOMPRESSIBLE FLUIDS
Stability of stationary rotation of cylinder filled with stratified viscous incompressible fluid N84-32054

INDEPENDENT VARIABLES
Model cloud relationships
[AD-A142690] N84-31871
Electroweak interaction parameters
[DE84-012910] N84-32159

INDEXES (DOCUMENTATION)
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009963] N84-32288
Energy Data Base. Serial titles with ISSN listing
[DE84-003876] N84-32289
Review of existing environmental and natural resource data bases
[DE84-012039] N84-32292
Publications of the Executive Office of the President, January 20, 1981 - March 31, 1984
[PB84-182328] N84-32296
Directory of computerized data files, 1984
[PB84-160126] N84-32303

INDUCTION (MATHEMATICS)
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31998

INDUSTRIAL ENERGY
AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784

INDUSTRIAL MANAGEMENT
CSIR activities in South Africa
[ISBN-0-7988-3029-6] N84-32340

INDUSTRIAL PLANTS
Getting into CAD at the Savannah River Plant
[DE84-011581] N84-31977

INDUSTRIES
Technology, innovation and regional economic development. Background paper 2: Encouraging high-technology development
[PB84-180181] N84-32310

INELASTIC COLLISIONS
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32183

INELASTIC SCATTERING
Algorithm for secondary electron emission from water vapor by high velocity ions
[DE84-011871] N84-32142

INELASTIC STRESS
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31688
Inelastic and dynamic fracture and stress analyses N84-31697

INEQUALITIES
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142695] N84-32007

INERTIA
Effect of inertia on finite near-tip deformation for fast Mode-3 crack growth
[AD-A142947] N84-31706

INERTIAL CONFINEMENT FUSION
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
Current status of calculations and measurements of ion stopping power in ICF plasmas
[DE84-005880] N84-32187

INFLATABLE STRUCTURES
Development, test and delivery of solid propellant generators for inflation of PFD's
[AD-A1300477] N84-31946

INFLATING
Development, test and delivery of solid propellant generators for inflation of PFD's
[AD-A1300477] N84-31946

INFORMATION DISSEMINATION
MIL-STD-1750A users group
[AD-P003547] N84-31151
Advanced data structure and geographic information systems N84-31742
Annotated bibliography of global resources information systems related publications N84-31746
Guide to computer-based training
[DE84-012244] N84-31975
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266
Special features of information presentation in teaching systems
[BLL-M-35804-(5828.4)] N84-32273
Technology transfer revisited
[DE84-012233] N84-32293
Key to oceanographic records documentation
[PB84-186360] N84-32299
Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-189158] N84-32302

INFORMATION MANAGEMENT
Advanced data structure and geographic information systems N84-31742
Knowledge based engineering for spatial database management and use N84-31745
Energy Data Base corporate author entries
[DE84-003877] N84-32290
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-186855] N84-32301
Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-189158] N84-32302

INFORMATION RETRIEVAL
A comprehensive guide to the literature on acoustic emission from composites
[DE84-011064] N84-31296
Determining the number of signals by information theoretic criteria
[AD-A142748] N84-31486
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31768
Content duplication among documents on specific subjects N84-32274
The user's mental model of an information retrieval system: Effects on performance N84-32275
Page indexing for textual information retrieval systems N84-32277
A non-first-normal-form relational database model N84-32280
Energy Data Base corporate author entries
[DE84-003877] N84-32290
NLM (National Library of Medicine) Online Services Reference Manual: Supplement
[PB84-186806] N84-32300

INFORMATION SYSTEMS
Inventory of numeric data for carbon dioxide research, revision 1
[DE84-013883] N84-31681
Automatic audit information system for software development
[AD-P003499] N84-32265
Page indexing for textual information retrieval systems N84-32277
Energy Data Base. Serial titles with ISSN listing
[DE84-003876] N84-32289
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-186855] N84-32301

INFORMATION THEORY
Determining the number of signals by information theoretic criteria
[AD-A142748] N84-31486

INFORMATION TRANSFER
Application of 1553B to MRASM (Medium Range Air to Surface Missile): A systems look
[AD-P003540] N84-31144
Embedded information transfer technology assessment
[AD-A142649] N84-31518

INFRARED ASTRONOMY
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321

INFRARED DETECTORS
Development of a transimpedance amplifier for cryotemperatures, study --- high sensitivity infrared detectors
[BMFT-FB-W-84-023] N84-31610

INFRARED IMAGERY
Seeker systems simulation, present capability and future technology N84-31254
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31866

INFRARED INSPECTION
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446

INFRARED RADIATION
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31874
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319

INFRARED SPECTRA
The physical nature of the symbiotic stars N84-32325

INFRARED SPECTROMETERS
New approaches to photothermal spectroscopy
[DE84-009237] N84-31310

INFRARED SPECTROSCOPY
Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy
[DE84-009246] N84-31327
Lithium cell reactions
[AD-A142976] N84-31522
Microwave and far infrared spectroscopy of transient molecules
[AD-A142962] N84-32134

INFRARED TELESCOPES
Double arch mirror study. Part 2: Engineering analysis report
[NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report
[NASA-CR-166589-PT-3] N84-31636
Double arch mirror study
[NASA-CR-166589] N84-31637
Simulation requirements for the Large Deployable Reflector (LDR)
[NASA-CR-171140] N84-32317

INFRARED TRACKING
Seeker systems simulation, present capability and future technology N84-31254

INHIBITORS
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011081] N84-31406

INHOMOGENEITY
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073

INITIATORS (EXPLOSIVES)
Combustion of redox mixes in the Through Bulkhead Initiator (TBI) configuration
[SNIAS-841-422-115] N84-31332

INJECTORS
Protective plasma envelope
[DE84-013316] N84-32194

INSOLATION
SERI photovoltaics advanced research and development: FY 1983 accomplishments
[DE84-004493] N84-31789

INSTALLING
Proposed MIL-STD for avionics installation interfaces
[AD-P003578] N84-31183

INSTITUTIONS
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271

INSTRUCTORS
Concurrency of design criteria: A key to trainer readiness
[AD-P003454] N84-32231
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P003460] N84-32237
User friendly authoring languages: An alternative approach
[AD-P003461] N84-32238

INSULATION
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285

INTEGRAL EQUATIONS
Calculation of electromagnetic fields on the surface of and inside cavities --- nuclear explosion effects
[SNIAS-841-422-108] N84-31506
Transient 3-dimensional thermoelasticity by the integral equations method
[CETIM-11-B-071] N84-31717

INTEGRATED CIRCUITS
Multi-criteria approach to selection of optimal connections in large-scale integrated circuits N84-31436
Measurement of integrated circuit element dimensions taking into account real etching profile according to diffraction pattern N84-31437
Modelling of transfer processes in monopolar semiconductor structures with submicron dimensions N84-31453
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460
Monolithic microwave integrated circuits: Interconnections and packaging considerations
[NASA-TM-83774] N84-31461
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510
Princeton VLSI project
[AD-A142959] N84-31521
Development of thermionic integrated circuits for applications in hostile environments
[DE84-011374] N84-31539
Continuation of research in computer simulation of integrated circuits
[AD-A143005] N84-31970

INTEGRATED ENERGY SYSTEMS
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973

INTEGRITY
An introduction to the avionics integrity program
[AD-P003565] N84-31170

INTERACTIONAL AERODYNAMICS
Supersonic jet-cavity interaction pulsation N84-32089

INTERFACES
A programmable bus control interface
[AD-P003536] N84-31140
Single chip MIL-STD-1553B bus interface unit keeps pace with chip sets
[AD-P003537] N84-31141
MIL-STD-1553 interface application notes
[AD-P003539] N84-31143
The KAPSE (Kernel Ada (Trademark) Programming Support Environment) interface team
[AD-P003557] N84-31161

Defense industry attitudes about AF interface standards report of an electronics industries association survey [AD-P003570] N84-31175
Proposed MIL-STD for avionics installation interfaces [AD-P003578] N84-31183
Mathematical model for a simplified Bridgman-Stockberger crystal growing system [NASA-CR-171108] N84-32202
Logical optimization for database uniformization [NASA-CR-173836] N84-32282

INTERFERENCE
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
Adaptive multibeam antenna array N84-31430

INTERFEROMETRY
Nonstationary oblique-shock-wave reflections in air [UTIAS-270] N84-31582
Development of a device for evaluation of interferograms [BMFT-FB-T-84-097] N84-31613
Preliminary experiments on phase conjugation for flow visualization — barium titanate single crystals [NASA-TM-83766] N84-32169

INTERMETALLICS
A combined thermodynamic study of nickel-base alloys [DE84-013467] N84-31388

INTERNAL COMBUSTION ENGINES
Research and development of alcohol fuel usage in spark ignited engines [DE84-011177] N84-31412
Producer gas: Another fuel for motor transport [DE84-901066] N84-31416

INTERNAL ENERGY
Diffusion transfer during near-sonic turbulence N84-32090

INTERNATIONAL COOPERATION
Space transportation systems of the future N84-31236
International Meteorological Satellite System: Issues and options [PB84-199603] N84-31889

INTERNATIONAL SYSTEM OF UNITS
Data word standardization [AD-P003543] N84-31147

INTERPOLATION
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
Multiple grid methods for equations of the second kind with applications in fluid mechanics [MATH-CENTRE-TRACTS-163] N84-32018
Sources of error in objective analysis [AD-A142772] N84-32020

INTERSTELLAR EXTINCTION
Study of variable extinction of hot stars with circumstellar dust shells [NASA-CR-173844] N84-32315

INTERSTELLAR MATTER
Optical and infrared polarization as a probe of matter near stars N84-32324

INVENTORY MANAGEMENT
An evaluation of the system 2000 data base management system for use in major item system mapping [DE84-013130] N84-32296

INVERSIONS
Asteroid light inversion [NASA-CR-173864] N84-32316

INVERTERS
AC propulsion system for an electric vehicle, phase 2 [NASA-CR-168244] N84-31514

INVISCID FLOW
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087

IODINE LASERS
Studies of new media radiation induced laser [NASA-CR-173846] N84-31616

ION ACCELERATORS
Beam experiment programs in the USA [DE84-010804] N84-32138
Concept of a superconducting linac for low-velocity ions [DE84-011740] N84-32154

ION BEAMS
Ion beamlet steering for two-grid electrostatic thrusters [NASA-CR-174671] N84-31274
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions [DE84-001300] N84-31359
Dual ion beam deposition of carbon films with diamondlike properties [NASA-TM-83743] N84-31512
Beam experiment programs in the USA [DE84-010804] N84-32138
Electron capture cross sections in high energy He2+ + neutral Li collisions [IPPJ-679] N84-32182
Current status of calculations and measurements of ion stopping power in ICF plasmas [DE84-005880] N84-32187

ION CONCENTRATION
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036

ION EMISSION
Fracto-emission from graphite/epoxy composites [NASA-CR-173845] N84-31291

ION EXCHANGING
Transport behavior of multivalent beta aluminas [AD-A142988] N84-31382

ION IMPLANTATION
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions [DE84-001300] N84-31359

ION INJECTION
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research [IPPJ-678] N84-32184

ION IRRADIATION
Effect of ion treatment of substrates on initial stage of buildup of metal films N84-31439
Probing a plasma with high-energy beams of atoms using threshold detectors [DE84-013380] N84-32195

ION MICROSCOPES
Field ion microscopy and spectroscopy of hydrogen in metals [DE84-012972] N84-31366

ION SOURCES
Dual arc penning ion source gas flow experiments [DE84-011637] N84-32151
Pulsed high-current source of negatively charged hydrogen ions [DE84-012969] N84-32158

IONIC COLLISIONS
Electron capture cross sections in high energy He2+ + neutral Li collisions [IPPJ-679] N84-32182

IONIZATION
Conceptual basis of resonance ionization spectroscopy [DE84-011682] N84-31318
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches [DE84-011444] N84-31536

IONIZATION CHAMBERS
The study of efficient low-power diffraction designs [NASA-CR-171142] N84-31598

IONIZING RADIATION
Ionizing emissions and electronics [AD-A142065] N84-31466

IONOSPHERE
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma [INPE-3206-PRE/564] N84-31244
Comparison between density profiles obtained at Cachoeira Paulista, Brazil, and deduced from IRI-79 model [INPE-3136-PRE/527] N84-31843

IONOSPHERIC ELECTRON DENSITY
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma [INPE-3206-PRE/564] N84-31244

IONS
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Further effects of ions in the arcs [DE84-011781] N84-32149
Electron capture cross sections in high energy He2+ + neutral Li collisions [IPPJ-679] N84-32182

IRON
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444

IRON ALLOYS
Environment and fracture [DE84-011454] N84-31360
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy [AD-A142059] N84-31702

IRON OXIDES
Point defects and diffusion mechanisms in the monoxides of the iron-group metals [DE84-012105] N84-32210

IRRADIATION
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions [DE84-001300] N84-31359
Laser Induced Chemistry. 1984 JPM Specialist Session [AD-A142922] N84-31400
CO2 laser decomposition of the alkyl phosphites N84-31402
Laser induced polymerization reactions in solid propellant binders N84-31403
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32098
Newly discovered effect of interaction of optical radiation and glass N84-32099
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode [DE84-008034] N84-32208

ISLAND ARCS
Volcanism, plutonism, and sedimentation in a late Devonian Submarine island-arc setting, Northern Sierra Nevada, California N84-31831

ISOLATION
Laser window with annular groove for thermal isolation [DE84-011114] N84-31625

ISOPARAMETRIC FINITE ELEMENTS
Stability and convergence of underintegrated finite element approximations N84-31696

ISOPYCNIC PROCESSES
Nonstationary oblique-shock-wave reflections in air [UTIAS-270] N84-31582

ISOTOPES
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy [DE84-011638] N84-31320

ISOTROPY
Preliminary study on elastoplasticity in large transformations [CETIM-11-E-360] N84-31719

ITERATION
A model of asynchronous iterative algorithms for solving large, sparse, linear systems [NASA-CR-172418] N84-31986
Flux-vector splitting and Runge-Kutta methods for the Euler equations [NASA-CR-172415] N84-31993
Multiple grid methods for equations of the second kind with applications in fluid mechanics [MATH-CENTRE-TRACTS-163] N84-32018

ITERATIVE SOLUTION
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations N84-31280

J

JAMMING
Computer analysis of phased array far-field patterns for non-symmetrical feed networks [AD-P003502] N84-31470
Effect of spatial decorrelation on nulling performance of linear adaptive array [AD-A143013] N84-31570

JAPAN
Flight service evaluation of two aluminum-brazed titanium spoilers [NASA-CR-172371] N84-31343

JET AIRCRAFT NOISE
Response of a plaster-wood room subjected to simulated sonic booms [UTIAS-276] N84-31701

JET ENGINE FUELS
Characterization and degradation studies on synthetic polymers for aerospace application [NASA-CR-166597] N84-31284

JET ENGINES
Interactive finite elements for general engine dynamics analysis N84-31698

JET FLOW
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner [AD-A142773] N84-31099
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32058
Propagation of gas jet in liquid N84-32057

JET IMPINGEMENT
Empirical relations for cavitation and liquid impingement erosion processes [NASA-TP-2339] N84-31349

JET MIXING FLOW
Propagation of gas jet in liquid N84-32057

JOINING
Monolithic microwave integrated circuits: Interconnections and packaging considerations [NASA-TM-83774] N84-31461

JOINTS (JUNCTIONS)
Multi-criteria approach to selection of optimal connections in large-scale integrated circuits N84-31436

JOURNAL BEARINGS
The Shock and Vibration Digest, volume 16, no. 7 [AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680

JUDGMENTS
The effect of information display format on multiple-cue judgment [AD-A142884] N84-31941

JUNCTION TRANSISTORS
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510

JUPITER (PLANET)
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation [NASA-TM-86131] N84-32333

JUPITER ATMOSPHERE
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331

K

KALMAN FILTERS
Application of an adaptive noise technique on state estimation to data smoothing [INPE-3167-PRE/552] N84-31963

KELVIN-HELMHOLTZ INSTABILITY
Feedback in separated flows over symmetric airfoils [NASA-TM-83758] N84-31091

KERNEL FUNCTIONS
Asymptotic estimates for resolvents of some nonintegrable Volterra kernels [AD-A141662] N84-31999

KEVLAR (TRADEMARK)
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft [NASA-CR-172344] N84-31287
Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests [DE84-012373] N84-31295

KINEMATICS
Conservation laws of wave action and potential enstrophy for Rossby waves in a stratified atmosphere [NASA-TM-86058] N84-31838
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326

KINETIC ENERGY
Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue [DE84-012911] N84-31367
Magnetically confined kinetic-energy storage ring: A new fundamental energy-storage concept [DE84-011531] N84-31793
Diffusion transfer during near-sonic turbulence N84-32090
Motion of vortex pair between parallel walls N84-32092

KINETIC EQUATIONS
Nonequilibrium optical and acoustic phonons in semiconductors N84-32085

KINETIC FRICTION
Lubrication during cutting: Wear and friction [CETIM-13-Y-322] N84-31653

KINETICS
Use of pulse radiolysis to measure high temperature kinetics [DE84-011702] N84-31324
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
Differential scanning calorimeter data acquisition system [AD-A143118] N84-31600

KLYSTRONS
High power RF klystrons for linear accelerators [DE84-012074] N84-31527

L

L-1011 AIRCRAFT
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft [NASA-CR-172344] N84-31287

LAGOONS
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730

LAGRANGE MULTIPLIERS
Numerical solution of viscoplastic flow problems by augmented lagrangians [AD-A142793] N84-31586

LAKE MICHIGAN
Ten-year forecasts of water quality in Lake Michigan using a deterministic eutrophication model [DE84-011425] N84-31804

LAKE ONTARIO
LANDSAT 4 band 6 data evaluation [E84-10175] N84-31737

LAMINAR FLOW
Theoretical and experimental investigations of asymmetric turbulent supersonic free shear layers N84-31088
A selection principle in Benard-type convection [NASA-CR-173869] N84-31559
Pressure effects on wall heat transfer during flame quenching [DE84-012265] N84-31575
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056

LAMINATES
Single and multiple fiber models for fracture of fibrous composites N84-31286
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading [NASA-CR-3815] N84-31290
Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites [SNIAS-841-551-102] N84-31296
Thermal-stress analysis for wood composite blade — horizontal axis wind turbines [NASA-CR-173830] N84-31685
Nonlinear Structural Analysis [NASA-CP-2297] N84-31686
A shear deformable shell element for laminated composites N84-31691
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

LAND
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases [NASA-TM-86096] N84-31761

LAND MANAGEMENT
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases [NASA-TM-86096] N84-31761

LANDSAT SATELLITES
Lineaments of Texas: Possible surface expressions of deep-seated phenomena [DE84-010827] N84-31858

LANDSAT 4
Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper [E84-10056] N84-31731
Characterization of the LANDSAT sensors' spatial responses [E84-10171] N84-31734
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting [E84-10176] N84-31738
Relative radiometric calibration of LANDSAT TM reflective bands [E84-10179] N84-31750
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper [E84-10180] N84-31751
Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper [E84-10181] N84-31752
TM digital image products for applications — computer compatible tapes [E84-10183] N84-31754
Spectral characterization of the LANDSAT Thematic Mapper sensors [E84-10184] N84-31755
Relative radiometric calibration of LANDSAT TM reflective bands [E84-10186] N84-31757
Investigation of LANDSAT D Thematic Mapper geometric performance: Line to line and band to band registration — Toulouse, France and Mississippi, U.S.A. [E84-10187] N84-31758
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation — San Matteo Bridge and Stockton, California [E84-10188] N84-31759

LANDSAT 5
Characterization of the LANDSAT sensors' spatial responses [E84-10171] N84-31734
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting [E84-10176] N84-31738
Relative radiometric calibration of LANDSAT TM reflective bands [E84-10179] N84-31750

LANGUAGE PROGRAMMING
Software design issues in the implementation of hierarchical display editors N84-31953

LANTHANUM FLUORIDES
Recent damage results for antireflection coatings at 355 NM [DE84-011560] N84-31388

LARGE SCALE INTEGRATION
MIL-STD-1553B Marconi LSI chip set in a remote terminal application [AD-P003538] N84-31142
Third generation MIL-STD-1553B LSI chip set [AD-P003542] N84-31146
Circuit engineering principles for construction of bipolar large-scale integrated circuit storage devices and very large-scale main memory N84-31441

LARGE SPACE STRUCTURES
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2 [NASA-CR-161590] N84-31283
Space Station Systems Analysis Study. Volume 2: Program review report [NASA-CR-161231] N84-31284
Space Station Systems Analysis Study. Volume 2: Program options, book 1, parts 1 and 2 [NASA-CR-161927] N84-31285
Digital control system for space structural dampers [NASA-CR-173867] N84-31287
Hoop/column antenna RF verification model. Volume 2: Analysis and correlation [NASA-CR-172413] N84-31462
Simulation requirements for the Large Deployable Reflector (LDR) [NASA-CR-171140] N84-32317
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment [NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
Studies of low-mass star formation with the large deployable reflector [NASA-TM-85960] N84-32328

LARMOR PRECESSION
A study of a two-frequency NMR maser N84-31615

LASER APPLICATIONS
USSR report: Space [JPRS-USP-84-004] N84-31228
Space transportation systems of the future N84-31236
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules [AD-A143017] N84-31303
Simulations of erosion/corrosion surface chemical reactions with a laser beam [AD-A143001] N84-31354
Nonlinear theory of the free-electron laser [INPE-3193-PRE/557] N84-31618
Laser-assisted solar cell metallization processing [NASA-CR-173875] N84-31619
Diagnostics for an XUV/soft X-ray laser [DE84-012593] N84-31628
Laser color recording unit [BMFT-FB-T-84-098] N84-31633
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation [JPRS-UNE-84-001] N84-31903
IRIS pulsing ruby light source N84-32066
New type of dye laser with light-induced distributed feedback N84-32067
Experimental study of strong nonlinear-optics effects in liquid crystals N84-32071
Production of dense plasma column in strong magnetic fields and its diagnosis by laser methods N84-32104
Theory of acoustic speckle N84-32114
Optically pumped polarized alkali atomic beams and targets [DE84-012389] N84-32147
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training [AD-P003481] N84-32248

LASER DAMAGE
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922

LASER FUSION
Operational performance of the Antares alignment system
[DE84-012659] N84-31632
LASER HEATING
Surface modification and coatings: A technical assessment
[DE84-012483] N84-31396
LASER INTERFEROMETRY
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174636] N84-31595
LASER MATERIALS
Modal parameter estimation via shaker versus speaker excitation
[DE84-012697] N84-31223
Recent damage results for antireflection coatings at 355 NM
[DE84-011560] N84-31388
Studies of new media radiation induced laser
[NASA-CR-173846] N84-31616
IRIS pulsing ruby light source N84-32066
LASER MODES
IRIS pulsing ruby light source N84-32066
Optically pumped polarized alkali atomic beams and targets
[DE84-012389] N84-32147
LASER OUTPUTS
Simulations of erosion/corrosion surface chemical reactions with a laser beam
[AD-A143001] N84-31354
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
CO2 laser decomposition of the alkyl phosphites N84-31402
Laser induced polymerization reactions in solid propellant binders N84-31403
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
A blackbody-pumped CO2-N2 transfer laser
[NASA-TP-2347] N84-31617
Diagnostics for an XUV/soft X-ray laser
[DE84-012593] N84-31626
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065
Experiments in development of powerful dye laser N84-32095
Multifrequency emission from submillimeter lasers N84-32096
Focusers of obliquely incident laser radiation N84-32099
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198
LASER PLASMAS
A new model of Raman spectra in laser produced plasma
[DE84-009825] N84-32188
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
LASER PUMPING
A blackbody-pumped CO2-N2 transfer laser
[NASA-TP-2347] N84-31617
Nonlinear theory of the free-electron laser
[INPE-3193-PRE/557] N84-31618
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
IRIS pulsing ruby light source N84-32066
New type of dye laser with light-induced distributed feedback N84-32067
Source of optical pumping for high-resolution spectroscopy with semiconductor laser N84-32070
LASER RANGE FINDERS
Phase light range finder N84-31447
LASER SPECTROMETERS
Total aerosol volume computed from laser spectrometer particle-size data for comparison with flame photometer total-mass data
[AD-A143171] N84-31306
LASER SPECTROSCOPY
Versatility of laser induced fluorescence line narrowing in chemical analysis
[DE84-012634] N84-31316
Conceptual basis of resonance ionization spectroscopy
[DE84-011662] N84-31318
Historical survey of resonance ionization spectroscopy
[DE84-011654] N84-31319
LASER TARGETS
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
LASER WINDOWS
Laser window with annular grooves for thermal isolation
[DE84-011114] N84-31625
LASERS
Development of a multidetector deflection measurement system
[DE84-013580] N84-31631
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32061
LATCHES
Radial Si latches vibration test data review
[NASA-TM-86454] N84-31638
LATITUDE
Effects of climate on kininogen levels in healthy human subjects N84-31907
LAUNCH DATES
List of recent Soviet space launches N84-31239
LEACHING
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31826
LEAD ACID BATTERIES
Study of bipolar batteries
[DE84-013193] N84-31540
Test and evaluation of the Philips Model PE 1701 and Lester Model 9965 electric vehicle battery chargers
[DE84-901243] N84-31541
LEAST SQUARES METHOD
HEART OF GOLD: Computer routines for large sparse, least squares computations
[PB84-196492] N84-31987
LENS ANTENNAS
Moebius r-2R lens
[AD-P003511] N84-31479
Feed error effects on lens performance
[AD-P003513] N84-31481
LENSES
Moebius r-2R lens
[AD-P003511] N84-31479
Feed error effects on lens performance
[AD-P003513] N84-31481
LIBRARIES
RFQ simulation code
[DE84-011385] N84-31499
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276
EPA (Environmental Protection Agency) journal holdings report, 1983
[PB84-194877] N84-32304
LIFE (DURABILITY)
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft
[NASA-CR-172344] N84-31287
Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests
[DE84-012373] N84-31295
Characterization of thermo-mechanical fatigue N84-31673
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260
LIFE CYCLE COSTS
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P003588] N84-31193
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230
LIFE SCIENCES
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation
[JPRS-UNE-84-001] N84-31903
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-012] N84-31916
LIGHT (VISIBLE RADIATION)
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
LIGHT AIRCRAFT
Simulated crash decelerations in a light aircraft cabin
[AD-A142808] N84-31102
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114
LIGHT ALLOYS
Powder metallurgy of light metal alloys for demanding applications
[AD-A142086] N84-31352
LIGHT AMPLIFIERS
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
LIGHT CURVE
Asteroid light inversion
[NASA-CR-173864] N84-32316
Theoretical study of cepheid light curves
[DE84-012453] N84-32322
LIGHT EMITTING DIODES
Radiation effects in optoelectronic devices
[DE84-012869] N84-32176
LIGHT IONS
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
LIGHT SCATTERING
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174636] N84-31595
LIGHT SOURCES
Theory of 4-wave mixing for VUV generation
[DE84-011663] N84-31630
LIGHTNING
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597
LINE CURRENT
Calculation of currents induced in a network of overhead power lines by an electromagnetic impulse
[SNIAS-841-422-109] N84-31507
LINE OF SIGHT
Terminal control for command to line of sight guided missile N84-31252
Development of a multidetector deflection measurement system
[DE84-013580] N84-31631
LINE SPECTRA
Design of short-wave absorption lines N84-31433
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
Line studies of Wolf-Rayet stars: The WN subclass N84-32311
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32328
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335
LINEAR ACCELERATORS
Operational parameters of a 2.0-MeV RFQ linac
[DE84-011368] N84-31498
RFQ simulation code
[DE84-011385] N84-31499
High power RF klystrons for linear accelerators
[DE84-012074] N84-31527
Physics of ion sputtering
[DE84-011664] N84-32150
Concept of a superconducting linac for low-velocity ions
[DE84-011740] N84-32154
Phase and amplitude control system for Stanford Linear Accelerator
[DE84-011773] N84-32156
Future accelerators using micro-fabrication technology
[DE84-002692] N84-32157
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
LINEAR ARRAYS
A comparative study of linear array synthesis technique using a personal computer
[AD-P003500] N84-31468

The use of overlapped subarray techniques in simultaneous receive beam linear arrays
[AD-P003501] N84-31469
Feed error effects on lens performance
[AD-P003513] N84-31481
Antenna pattern characteristics of fine-steered pencil beams
[AD-P003516] N84-31484
Effect of spatial decorrelation on nulling performance of linear adaptive array
[AD-A143013] N84-31570

LINEAR EQUATIONS
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2
[BLL-M-36595-(5828.4)] N84-31337
A model of asynchronous iterative algorithms for solving large, sparse, linear systems
[NASA-CR-172418] N84-31988

LINEAR POLARIZATION
Theoretical models for the polarization of astronomical masers N84-32313

LINEAR PROGRAMMING
Stable method for solving linear programming problem with approximate data N84-32077
Two-phase methods of solving canonical problem of linear programming N84-32078

LINEAR SYSTEMS
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem
[NASA-CR-3828] N84-31217
A model of asynchronous iterative algorithms for solving large, sparse, linear systems
[NASA-CR-172418] N84-31988

LINEARITY
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Vibrations and stability of mechanical ystems, 3 N84-31681

LINING PROCESSES
Investigations of mechanical properties of high strength steels and their suitability for glass lining
[BMFT-FB-T-84-076] N84-31370

LIQUEFIED NATURAL GAS
Cost effectiveness of converting to alternative motor vehicle fuels. A technical assistance study for the city of Longview
[DE84-010479] N84-31415

LIQUID AMMONIA
Ammonia boiling in long tubes. Heat transfer and charge loss in vertical and horizontal tubes
[CETIM-14-C-011] N84-31588

LIQUID CHROMATOGRAPHY
Supercritical and chromotography/supersonic jet spectroscopy
[DE84-012124] N84-31312

LIQUID CRYSTALS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Properties of bubble domains in cholesteric-nematic mixtures N84-32039
Experimental study of strong nonlinear-optics effects in liquid crystals N84-32071
Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components
[AD-A143028] N84-32205
Liquid crystal materials for matrix displays
[AD-A143039] N84-32206
Improved materials for DC dynamic scattering at elevated temperatures
[AD-A143076] N84-32207

LIQUID FLOW
Liquid flow through mesh-wire gauze wicks — models
[NLR-TR-83104-U] N84-31592

LIQUID PHASES
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

LIQUID-LIQUID INTERFACES
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31565
Hopf bifurcation in two-component flow
[AD-A142844] N84-31568

LIQUID-SOLID INTERFACES
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142899] N84-31381

LIQUID-VAPOR EQUILIBRIUM
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417

LIQUID-VAPOR INTERFACES
Propagation of gas jet in liquid N84-32057

LIQUIDS
Temperature dependence of the Raman OH-stretching overtone from liquid water
[AD-A143131] N84-31305
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160

LITERATURE
A comprehensive guide to the literature on acoustic emission from composites
[DE84-011064] N84-31296

LITHIUM
Perspective of the corrosive behavior of lithium and sodium
[DE84-011635] N84-31362
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Lithium cell reactions
[AD-A142976] N84-31522
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31566
Electron capture cross sections in high energy He2+ + neutral Li collisions
[IPPJ-679] N84-32182

LITHIUM ALLOYS
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339

LITHIUM CHLORIDES
Lithium cell reactions
[AD-A142976] N84-31522
Multicell LiSOCl sub 2 reserve battery
[DE84-012812] N84-31542

LITHIUM COMPOUNDS
Enhanced low-temperature performance of a multicell LiSOC1sub2 battery
[DE84-011660] N84-31537

LITHIUM OXIDES
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544

LITHIUM SULFUR BATTERIES
Multicell LiSOCl sub 2 reserve battery
[DE84-012812] N84-31542

LITHOLOGY
The neogene stratigraphy of the Central Florida Panhandle N84-31833

LITHOSPHERE
Seismological studies of the continental lithosphere
[PB84-194752] N84-31862

LOAD DISTRIBUTION (FORCES)
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142840] N84-31100

LOAD TESTS
Calibration of CT-4A fatigue test article, March 1983
[AD-A142880] N84-31115

LOADING
Age-related responses to de- and hyperhydration N84-31905

LOADS (FORCES)
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090
Transfer during sliding wear of selected metal systems N84-31341
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83778] N84-31348
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
A method for the combination of stochastic time varying load effects N84-31669
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974

LOCKING
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639

LOGISTICS
Increased readiness through modularity
[AD-P003491] N84-32257

LOGISTICS MANAGEMENT
Concurrency of design criteria: A key to trainer readiness
[AD-P003454] N84-32231

LONG DURATION EXPOSURE FACILITY
Testing of coatings in space, Long Duration Exposure Facility (LDEF)
[BMFT-FB-W-84-017] N84-31269

LONG TERM EFFECTS
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A142919] N84-31947

LONGITUDINAL CONTROL
Pitch control of a satellite using stabilizing flaps
[INPE-3185-PRE/550] N84-31246

LOSSES
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450

LOW ALTITUDE
Missile system for low altitude air defence N84-31255
Calculation of low altitude electromagnetic pulses in the first moments — after a nuclear explosion
[SNIAS-841-422-105] N84-31503
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003468] N84-32243
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training
[AD-P003481] N84-32248

LOW COST
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476

LOW SPEED WIND TUNNELS
The 6M x 6M low speed wind tunnel N84-31221

LOW TEMPERATURE
Enhanced low-temperature performance of a multicell LiSOC1sub2 battery
[DE84-011660] N84-31537
Low temperature geothermal resource evaluation of the Moses Lake-Ritzville-Connell area, Washington
[DE84-012505] N84-31773

LOW THRUST
Optimal low-thrust transfers to geosynchronous orbit N84-31240

LOWER CALIFORNIA (MEXICO)
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810

LUBRICATION
Lubrication during cutting: Wear and friction
[CETIM-13-Y-322] N84-31653

LUMINESCENCE
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083

LUNAR TIDES
Observations of long-period motions of the Earth at the South Pole N84-31823

LYMAN ALPHA RADIATION
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326

M

MACH NUMBER
A review of some Reynolds number effects related to bodies at high angles of attack
[NASA-CR-3809] N84-31097

MACHINE TOOLS
Turning of hardened ferrous meterials with homogeneous CBN tool tips
[CSIR-TRANS-1726] N84-31418

MAGMA
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828

MAGNESIUM ALLOYS
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356

MAGNESIUM OXIDES
In-situ TEM investigations of graphic-epitaxy and small particles
[NASA-CR-166593] N84-32201

MAGNET COILS
Normal zone detectors for a large number of inductively coupled coils, revision 1
[DE84-011053] N84-31526
Switching transients in a superconducting coil
[DE84-012592] N84-31532

MAGNETIC ANOMALIES
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
MAGNETIC CORES
Improved superconducting magnet wire
[DE84-011233] N84-31531
MAGNETIC EFFECTS
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083
MAGNETIC FIELD CONFIGURATIONS
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197
MAGNETIC FIELDS
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083
Production of dense plasma column in strong magnetic fields and its diagnosis by laser methods N84-32104
Plasma beam instability of bounded electron beam in weak magnetic field N84-32105
Protective plasma envelope
[DE84-013316] N84-32194
MAGNETIC INDUCTION
Cold-cathode gas-discharge modulator power tube N84-31443
MAGNETIC POLES
Observations of long-period motions of the Earth at the South Pole N84-31823
MAGNETIC PUMPING
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
MAGNETIC STORMS
Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil
[INPE-3038-PRE/469] N84-31839
MAGNETIC TAPES
NIMBUS 7 Earth Radiation Budget (ERB) matrix user's guide. Volume 2: Tape specifications
[NASA-CR-170620] N84-31961
A software scheme for managing magnetic tape storage space
[AD-A142847] N84-31969
MAGNETOHYDRODYNAMIC FLOW
Protective plasma envelope
[DE84-013316] N84-32194
MAGNETOHYDRODYNAMIC STABILITY
Bremsstrahlung from longitudinal plasma waves produced by subthermal electrons in plasma N84-32102
Plasma beam instability of bounded electron beam in weak magnetic field N84-32105
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
Disruptive instabilities in a poloidal divertor tokamak
[DE84-013054] N84-32192
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation
[NASA-TM-86131] N84-32333
MAGNETOHYDRODYNAMIC WAVES
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation
[NASA-TM-86131] N84-32333
MAGNETOHYDRODYNAMICS
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197
MAGNETOSPHERE
Theoretical studies of the pulsar magnetosphere N84-31809
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336
MAGNETOSTATIC FIELDS
Electromagnetic radiation and scattering in a plasma with azimuthal biasing field N84-32180
MAGNETOSTATICS
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
MAINTAINABILITY
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study
[AD-A143104] N84-31211
MAINTENANCE
Composite structure repair
[AD-A141456] N84-31300
The Electric Vehicle Project
[DE84-011788] N84-32309
MAINTENANCE TRAINING
Cost-effective and efficient maintenance training devices: A user accepted design process
[AD-P003456] N84-32233
MAN MACHINE SYSTEMS
Development of a computer-assisted simulation of tactical voice communications. Phase 1: Conceptual design
[AD-A143036] N84-31492
Knowledge-based expert systems for crop identification N84-31744
Results of psychophysiological study of Videoton terminal operators N84-31919
Pilot oriented performance measurement
[AD-P003450] N84-32227
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P003460] N84-32237
User-friendly software: The role of the user
[AD-P003489] N84-32256
MANAGEMENT
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276
MANAGEMENT ANALYSIS
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271
MANAGEMENT PLANNING
The Program Planning Review (PPR): Milestone or millstone?
[AD-P003493] N84-32259
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260
Automatic audit information system for software development
[AD-P003499] N84-32265
Equitable assignment rules
[AD-A142809] N84-32268
Cost and schedule control systems criteria for contract performance measurement, information pamphlet
[DE84-012576] N84-32269
Classification management. Journal of the national classification management society, volume 19, 1983
[AD-A143015] N84-32286
MANAGEMENT SYSTEMS
Consideration of MIL-STD-1760, aircraft/store electrical interface standard on stores management system architectures
[AD-P003529] N84-31133
Automated Construction Management System (ACMS). Volume 1: User's guide
[AD-A143031] N84-31971
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
Software progress tracking system
[AD-P003488] N84-32255
MANGANESE ALLOYS
Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys
[NASA-CR-173985] N84-31350
Characterization of common steels. Report of partial test Number M6-845900, Number 4 N84-31376
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-061] N84-31659
MANIPULATORS
Automatic camera tracking for remote manipulators
[DE84-011455] N84-31608
MANNED SPACECRAFT
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
MANPOWER
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
MANUFACTURING
Advance in materials technology: Monitor issue number 1
[PB84-196286] N84-31377
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31478
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340
MAPPING
African Doppler Surveys (ADOS)
[AD-A142736] N84-31764
DMA (Defense Mapping Agency) policy for digital MC and G (Mapping, Charting, and Geodesy) support of advanced systems
[AD-A142746] N84-31765
DMA (Defense Mapping Agency): The digital revolution
[AD-A142787] N84-31767
Complete Bouguer gravity anomaly map, Cascade Mountains, Washington
[DE84-012548] N84-31858
MAPS
Complete Bouguer gravity anomaly map, Cascade Mountains, Washington
[DE84-012548] N84-31858
US annual average wind power
[DE84-012215] N84-31877
MARINE ENVIRONMENTS
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730
A pioneer deep ocean mining venture
[PB84-199645] N84-31780
MARINE METEOROLOGY
METLIB-2: A program library for calculating and plotting atmospheric and oceanic fields
[PB84-205434] N84-31890
Selected worldwide marine weather broadcasts
[PB84-192655] N84-31894
MARKERS
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31801
MARKET RESEARCH
Emerging battery technologies
[DE84-011193] N84-31538
MARKETING
Profit responsibilities in the simulation and training equipment industry
[AD-P003497] N84-32263
MARKING
Front lighted optical tooling method and apparatus
[DE84-011106] N84-31602
MASERS
A study of a two-frequency NMR maser N84-31615
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Chemical lasers N84-32093
Theoretical models for the polarization of astronomical masers N84-32313
MASS DISTRIBUTION
Anthropometric and mass distribution characteristics of the adult female, revised
[AD-A143096] N84-31939
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142946] N84-31948
MASS FLOW RATE
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590
MASS SPECTROMETERS
Field ion microscopy and spectroscopy of hydrogen in metals
[DE84-012972] N84-31366
Plasma discharge elemental detector for a mass spectrometer
[DE84-011078] N84-31604
MASS SPECTROSCOPY
Supercritical and chromotography/supersonic jet spectroscopy
[DE84-012124] N84-31312
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy
[DE84-011638] N84-31320

MASS TRANSFER
Hydrogen transport, mixing, and combustion studies [DE84-012455] N84-31317
Perspective of the corrosive behavior of lithium and sodium [DE84-011696] N84-31362
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids [DE84-008935] N84-31572
MATCHING
Broadband microstrip matching techniques [AD-P003506] N84-31474
MATERIALS
Investigation of role of subsurface zones in wear of materials [DE84-012752] N84-31365
MATERIALS HANDLING
Automation of a stamping press using sequential hydraulic manipulators [CETIM-1-4N-090] N84-31422
MATHEMATICAL MODELS
Turbulent diffusion behind vehicles: Experiments and verification of roadway models [PB84-194273] N84-31101
Interactive aircraft flight control and aeroelastic stabilization [NASA-CR-173866] N84-31214
Optimization of the capture process for a rigid satellite stabilized by gravity gradient [INPE-3184-PRE/549] N84-31245
Empirical relations for cavitation and liquid impingement erosion processes [NASA-TP-2339] N84-31349
Scattering properties of a moving dielectric object [AD-A142845] N84-31489
New approach to the effective stress principle [DE84-008983] N84-31574
Liquid flow through mesh-wire gauze wicks — models [NLR-TR-83104-U] N84-31592
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672
Mathematical modeling of longitudinal profile adjustment in alluvial streams N84-31726
The near-Earth magnetic field at 1980 determined from MAGSAT data [E84-10170] N84-31733
US EPA (Environmental Protection Agency) regional oxidant model, background and overview [PB84-201680] N84-31806
AFGL cloud modeling program: Annex [AD-A143084] N84-31872
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
Specifying the behavior of concurrent systems [NASA-CR-173839] N84-31957
Efficient sequential designs with binary data [AD-A142904] N84-32008
Research in nonlinear motion [AD-A143000] N84-32013
Assessment of local influence [AD-A143002] N84-32014
Applied chromodynamics [DE84-009136] N84-32152
A survey of the methods of MHD analysis of magnetic islands [DE84-008858] N84-32197
Numerical calculations in quantum field theories [DE84-010892] N84-32217
Nonlinear analysis of Stirling engine thermodynamics [DE84-013493] N84-32219
One method of assessing the validity of organizational-systems modelling [BLL-M-35605-(5828.4)] N84-32222
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT [AD-A142788] N84-32267
Theoretical models for the polarization of astronomical masers N84-32313
Simulation requirements for the Large Deployable Reflector (LDR) [NASA-CR-171140] N84-32317
Three-dimensional model for fusion processes [DE84-011731] N84-32339
MATHEMATICS
USSR report: Physics and mathematics [JPRS-UPM-84-005] N84-32061
MATRICES (MATHEMATICS)
Potential application of artificial concepts to aerodynamic simulation [NASA-TM-85978] N84-31093
Single and multiple fiber models for fracture of fibrous composites N84-31286
Element-by-element solution procedures for nonlinear structural analysis N84-31694
Automatic finite element generators N84-31695
Nonnegative matrices in dynamic programming [MATH-CENTRE-TRACTS-167] N84-32028
Further effects of ions in the arc [DE84-011761] N84-32149
MATRIX METHODS
Convergence of bivariate cardinal interpolation [AD-A142594] N84-32006
MAXIMUM LIKELIHOOD ESTIMATES
Statistical inference for reliability from stress strength relationships: The normal case [AD-A142893] N84-32005
Assessment of local influence [AD-A143002] N84-32014
MEASURE AND INTEGRATION
On point processes — probability theory [MATH-CENTRE-TRACTS-165] N84-32025
MEASUREMENT
Automatic digital battery cell capacitance measurements [AD-A143143] N84-31523
MEASURING INSTRUMENTS
Determination of evaporation rates of organic solvents by thin-film evaporometer [DE84-012308] N84-31313
MECHANICAL DEVICES
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
Lubrication of machine elements [NASA-RP-1126] N84-31640
MECHANICAL DRIVES
Automotive Stirling engine development program [NASA-CR-174622] N84-32305
MECHANICAL PROPERTIES
Property screening and evaluation of ceramic turbine materials [AD-A142739] N84-31210
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites [NASA-CR-173670] N84-31289
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys [NASA-CR-173865] N84-31350
Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces [AD-A143041] N84-31355
Investigations of mechanical properties of high strength steels and their suitability for glass lining [BMFT-FB-T-84-076] N84-31370
Engineering properties of some coatings [DE84-002715] N84-31390
New sapphire and ruby components and their manufacture using diamond abrasives [CSIR-TRANS-1734] N84-31419
Role of texture and structural damage in plane strain deformation processing N84-31684
The Shock and Vibration Digest, volume 16, no. 7 [AD-A143958] N84-31679
Vibrations and stability of mechanical ystems, 3 N84-31681
Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components [AD-A143026] N84-32205
Liquid crystal materials for matrix displays [AD-A143039] N84-32206
MECHANICAL SHOCK
The Shock and Vibration Digest, volume 16, no. 4 [AD-A141077] N84-31676
MEDICAL SCIENCE
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation [JPRS-UNE-84-001] N84-31903
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-84-012] N84-31916
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-84-017] N84-31924
MEDITERRANEAN SEA
Discussion of the Ionian and Levantine Seas [DE84-011562] N84-31698
MELTS (CRYSTAL GROWTH)
Mathematical model for a simplified Bridgman-Stockbarger crystal growing system [NASA-CR-171108] N84-32202
MEMBRANES
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading [NASA-TM-86271] N84-31686
Effects of microwaves on cell membrane permeability [AD-A142979] N84-31913
Nonlinear dynamics in excitable nerve membranes N84-32037
MENTAL PERFORMANCE
Psychophysiological aspects of monotonous human activity N84-31911
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
Effect of body temperature on human work capacity N84-31928
MEROMORPHIC FUNCTIONS
Some observations concerning the zero-curves of the real and imaginary parts of Riemann's zeta function [MC-ZW-201/83] N84-32030
MESH
Another attempt to overcome the bent element blues [DE84-007785] N84-31571
On the controlled approximation order from certain spaces of smooth bivariate splines [AD-A142868] N84-32004
MESOSCALE PHENOMENA
Synoptic scale wind field properties from the SEASAT SASS [E84-10169] N84-31732
Applications of the AVE-SESAME data sets to mesoscale studies [NASA-CR-3819] N84-31866
Doppler-radar observation of the evolution of downdrafts in convective clouds [NASA-CR-173874] N84-31896
MESSAGE PROCESSING
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative [AD-A142831] N84-31488
MESSAGES
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative [AD-A142831] N84-31488
METABOLISM
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
METAL AIR BATTERIES
Technology base research project for electrochemical energy storage [DE84-012248] N84-31535
METAL COATINGS
Engineering properties of some coatings [DE84-002715] N84-31390
METAL CUTTING
Turning of hardened ferrous materials with homogeneous CBN tool tips [CSIR-TRANS-1728] N84-31418
Lubrication during cutting: Wear and friction [CETIM-13-Y-322] N84-31653
METAL FATIGUE
A new approach to the evaluation of the effects of stress state and interfacial properties on the behavior of advanced metal matrix composites [AD-A143063] N84-31294
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy [AD-A142059] N84-31702
METAL FILMS
Adhesion between polymers and evaporated gold and nickel films [NASA-TP-2360] N84-31379
Effect of ion treatment of substrates on initial stage of buildup of metal films N84-31439
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope [DE84-013423] N84-32214
METAL FINISHING
Metal finishing and vacuum processes groups [DE84-011046] N84-31358
METAL FUELS
USSR report: Space [JPRS-USP-84-004] N84-31228
Advantages of metallic fuels for rocket propulsion N84-31237
METAL JOINTS
Sodium compatibility of refractory metal alloy/304L braze joints [DE84-012877] N84-31364
METAL MATRIX COMPOSITES
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading [NASA-CR-3815] N84-31290
A new approach to the evaluation of the effects of stress state and interfacial properties on the behavior of advanced metal matrix composites [AD-A143063] N84-31294
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

METAL PLATES
Porous catalytic metal plate degeneration bed in a gas generator
[AD-D011078] N84-31407
METAL POWDER
Investigation of shock activated sintering and shock wave consolidation of selected powder materials
[DE84-013074] N84-31391
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
METAL SHEETS
Development of improved low-strain creep strength in Cabot alloy R-41 sheet — nickel base sheet alloy for reentry shielding
[NASA-CR-172392] N84-31346
METAL STRIPS
Role of texture and structural damage in plane strain deformation processing N84-31664
METAL SURFACES
Empirical relations for cavitation and liquid impingement erosion processes
[NASA-TP-2339] N84-31349
Nonlinear scattering of radio waves by metal objects N84-32049
METAL WORKING
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2
[BLL-M-35595-(5828.4)] N84-31337
METAL-METAL BONDING
Nondestructive testing of bonding by ultrasonic analysis: Preliminary study report proposed investigation program — metal bonding
[CETIM-13-V-010] N84-31660
METALLIC GLASSES
Environment and fracture
[DE84-011454] N84-31360
METALLIZING
Laser-assisted solar cell metallization processing
[NASA-CR-173875] N84-31619
METALLOIDS
Electromagnetic excitation of sound in metals N84-32082
METALS
Investigation of role of subsurface zones in wear of materials
[DE84-012752] N84-31365
Field ion microscopy and spectroscopy of hydrogen in metals
[DE84-012972] N84-31366
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31783
Electromagnetic excitation of sound in metals N84-32082
METASTABLE STATE
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160
METEORITES
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
METEOROLOGICAL CHARTS
METLIB-2: A program library for calculating and plotting atmospheric and oceanic fields
[PB84-205434] N84-31690
METEOROLOGICAL FLIGHT
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597
Measurements inside Oklahoma thunderstorms
[PB84-206911] N84-31691
METEOROLOGICAL INSTRUMENTS
Phase modulator in 41.650 MHz
[INPE-3177-PRE/544] N84-31515
METEOROLOGICAL PARAMETERS
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31696
METEOROLOGICAL RADAR
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31696
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258
METEOROLOGICAL SATELLITES
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31664
International Meteorological Satellite System: Issues and options
[PB84-199603] N84-31689
METEOROLOGICAL SERVICES
National Hurricane Operations Plan
[PB84-198637] N84-31688
Selected worldwide marine weather broadcasts
[PB84-192655] N84-31694
METEOROLOGY
Space research in Pakistan: A relentless pursuit N84-31227
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31646
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31664
Federal plan for meteorological services and supporting research, fiscal year 1985
[PB84-182732] N84-31694
A computer calculation and display station for slosh hurricane surge model data
[PB84-198753] N84-31687
International Meteorological Satellite System: Issues and options
[PB84-199603] N84-31689
Sources of error in objective analysis
[AD-A142772] N84-32020
METHANATION
Crystallite size and support effects on CO hydrogenation reactions
[DE84-012474] N84-31314
METHANE
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334
METHOD OF MOMENTS
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491
METHYL ALCOHOLS
Mechanistic studies of catalytic methanol synthesis
[DE84-006360] N84-31308
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334
Gaseous cementation in nitrogen-methanol atmospheres
[CETIM-12-G-284] N84-31374
METHYL COMPOUNDS
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218
METRICATION
Data word standardization
[AD-P003543] N84-31147
MEXICO
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
MICHIGAN
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 — Michigan, Wisconsin, and Minnesota
[DE84-012682] N84-31775
MICROANALYSIS
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
MICROBIOLOGY
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-017] N84-31924
MICROCOMPUTERS
Standardized computing system SDS80
[AD-P003585] N84-31190
The new algorithm for symbolic network analysis N84-31509
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709
Fracture mechanics formulas on microcomputers
[CETIM-100960] N84-31722
Automated Construction Management System (ACMS). Volume 1: User's guide
[AD-A143031] N84-31971
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
The arithmetic of differentiation
[AD-A142964] N84-32011
New technical information media
[CSIR-TRANS-1731] N84-32264
MICROCRYSTALS
Studies of hydrogenated amorphous silicon
[DE84-011886] N84-32211
MICROELECTRONICS
PAVE PILLAR: A maturation process for an advanced avionics architecture
[AD-P003568] N84-31173
Solid state research
[AD-A142991] N84-32204
MICROMECHANICS
Application of finite element substructuring to composite micromechanics
[NASA-TM-83729] N84-31288
MICROMETEOROLOGY
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111
MICROMINIATURIZATION
Development of thermionic integrated circuits for applications in hostile environments
[DE84-011374] N84-31533
MICROPROCESSORS
MIL-STD-1750A microprocessor chip set development
[AD-P003548] N84-31152
A high performance MIL-STD-1750A microprocessor
[AD-P003549] N84-31153
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003577] N84-31182
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208
Microprocessor enhanced real time manual control of an industrial robot
[DE84-011805] N84-31645
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250
Microprocessors in aircrew training devices
[AD-P003485] N84-32252
MICROSONICS
Alternating acoustoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449
MICROSTRIP TRANSMISSION LINES
Monolithic microwave integrated circuits: Interconnections and packaging considerations
[NASA-TM-83774] N84-31461
On the quasi-periodic microstrip snake antenna with metal trough backing
[AD-P003510] N84-31478
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
MICROSTRUCTURE
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012867] N84-31309
The effects of deformation mode and microstructure fracture-related properties of Ti alloys
[AD-A142691] N84-31353
Microstructural studies of hydrogen and deuterium in BCC refractory metals
[DE84-011506] N84-31357
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure
[DE84-012395] N84-31361
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation
[CSIR-TRANS-1726] N84-31842
Microstructural stability of copper electroplate
[DE84-010070] N84-32174
MICROWAVE AMPLIFIERS
Large-signal amplifier based on ferrimagnetic echo N84-31440
MICROWAVE ANTENNAS
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Broadband microstrip matching techniques
[AD-P003506] N84-31474
Wideband microstrip ring radiator
[AD-P003507] N84-31475
Feed error effects on lens performance
[AD-P003513] N84-31481

MICROWAVE COUPLING
Coupling of electromagnetic pulses created by a nuclear explosion on the ground with overhead power cables [SNIAS-841-422-107] N84-31505

MICROWAVE EQUIPMENT
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112

MICROWAVE SWITCHING
P-I-N Diode Switches Project [INPE-3171-PRE/541] N84-31516

MICROWAVE TRANSMISSION
Alternating acoustoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449

MICROWAVES
USSR report: Electronics and electrical engineering [JPRS-UEE-84-008] N84-31427
Dynamic characteristic of intense short microwave propagation in an atmosphere [DE84-002786] N84-31496
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature [AD-A142961] N84-31912
Effects of microwaves on cell membrane permeability [AD-A142979] N84-31913
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
Microwave and far infrared spectroscopy of transient molecules [AD-A142962] N84-32134
Measurement of LINAC bunch parameters using the Cerenkov effect [AD-A143128] N84-32136

MIE SCATTERING
Mie scattering as a technique for the sizing of air bubbles [AD-A142737] N84-32170

MILITARY AIRCRAFT
Historical research and development inflation indices for Army fixed and rotor winged aircraft [AD-A142943] N84-31085
A comparison of simulator procurement/program practices: Military versus commercial [AD-P003453] N84-32230

MILITARY HELICOPTERS
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training [AD-P003481] N84-32248

MILITARY OPERATIONS
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study [AD-A143104] N84-31211
Seeker systems simulation, present capability and future technology N84-31254
Ophthalmological investigation among contact lens wearers in military service [REPT-AR/MHAM-1983-1] N84-31940

MILITARY SPACECRAFT
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics [AD-A143012] N84-31268

MILITARY TECHNOLOGY
The NEBULA and MCF (Military Computer Family) standardization programs [AD-P003531] N84-31135
The NEBULA standard computer architecture [AD-P003532] N84-31136
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process [AD-A142849] N84-31247
Logistic support: A computer manufacturer's viewpoint [AD-P003496] N84-32262
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2 [AD-A142775] N84-32266

MILKY WAY GALAXY
Galactic cycles and their relationship to life on Earth [DE84-011737] N84-32329

MILLIMETER WAVES
Proceedings of the Antenna Applications Symp., volume 2 [AD-A142754] N84-31467

MINERAL DEPOSITS
NASA pilot land data system N84-31741
Geology hydrology and mineral resources of crystaline rock areas of Northeastern US [DE84-013671] N84-31774
Geology of the Portrerillos District, Atacama, Chile N84-31811
Geology and geochemistry of the Arctic prospect, Ambler District, Alaska N84-31814
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31816
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828
Argillic alteration associated with the Amethyst Vein System, Creede Mining District, Colorado N84-31832

MINERAL METABOLISM
Hypokinesia experiment studies effects of weightlessness N84-31234

MINERALOGY
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation [CSIR-TRANS-1726] N84-31642

MINERALS
Discrimination of iron alteration minerals in remote sensing data N84-31727
Petrography and depositional environment of the Herrin (no. 6) seam in central, eastern and northwestern Illinois N84-31813

MINES (EXCAVATIONS)
Performance and test criteria for dc fuses, phase 1 [PB84-202662] N84-31548

MINING
A pioneer deep ocean mining venture [PB84-199645] N84-31780

MINNESOTA
Habitability of the Earth N84-31740
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 --- Michigan, Wisconsin, and Minnesota [DE84-012682] N84-31775

MIRROR FUSION
Azimuthal electric fields and tandem ambipolarity [DE84-010843] N84-32189
START/TM: A study of start-up and fractional power operation of tandem mirror fusion reactors [DE84-011477] N84-32196

MIRRORS
Short wavelength optics for future free electron lasers [DE84-012316] N84-31626
Operational performance of the Antares alignment system [DE84-012659] N84-31632
Double arch mirror study. Part 1: Preliminary engineering report [NASA-CR-166589-PT-1] N84-31634
Double arch mirror study. Part 2: Engineering analysis report [NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report [NASA-CR-166589-PT-3] N84-31636
Double arch mirror study [NASA-CR-166589] N84-31637
Focusers of obliquely incident laser radiation N84-32099
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope [NASA-CR-171133] N84-32168
Microstructural stability of copper electroplate [DE84-010070] N84-32174

MISS DISTANCE
Warheads for SAM systems N84-31257

MISSILE CONTROL
Advanced Technology for SAM Systems Analysis Synthesis and Simulation [AGARD-LS-135] N84-31248
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31250
Some aspects of guidance loop design for SAM systems N84-31251
Terminal control for command to line of sight guided missile N84-31252
A new concept for guiding missiles with an application to the ground-air system N84-31253
Homing head imperfections altering missile guidance N84-31256

MISSILE SYSTEMS
Missile system for low altitude air defence N84-31255

MISSION PLANNING
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2 [NASA-CR-161590] N84-31263
Space Station Systems Analysis Study. Volume 2: Program review report [NASA-CR-161231] N84-31264

MIXED CRYSTALS
Crystalline photoconductive films for electrophotographic recording [BMFT-FB-T-84-099] N84-31614

MIXING
Hydrogen transport, mixing, and combustion studies [DE84-012455] N84-31317

MIXTURES
Effect of polydispersity on the cloud point curves of polymer mixtures [AD-A143159] N84-31384
New approach to the effective stress principle [DE84-006983] N84-31574

MODAL RESPONSE
The Shock and Vibration Digest, volume 16, no. 4 [AD-A141077] N84-31676

MODES
Investigation of role of subsurface zones in wear of materials [DE84-012752] N84-31365
Operating modes of superconducting current converters in service N84-31445

MODULATION TRANSFER FUNCTION
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation --- San Matteo Bridge and Stockton, California [E84-10188] N84-31759

MODULES
Increased readiness through modularity [AD-P003491] N84-32257

MOISTURE
Application of finite element substructuring to composite micromechanics [NASA-TM-83729] N84-31288

MOISTURE CONTENT
Analysis of moisture in solids: A review of the last decade or from Pande to the present [DE84-011166] N84-31326
Model cloud relationships [AD-A142690] N84-31871

MOISTURE METERS
Analysis of moisture in solids: A review of the last decade or from Pande to the present [DE84-011166] N84-31326

MOLDS
Development of normalized operative mode for making deposits for chemical analysis in MIG/MAG welding [CETIM-I.S.13.826] N84-31331

MOLECULAR BEAM EPITAXY
Superlattice structures grown by molecular beam epitaxy [DE84-011288] N84-32209

MOLECULAR CLOUDS
Studies of low-mass star formation with the large deployable reflector [NASA-TM-85960] N84-32328

MOLECULAR COLLISIONS
Resonances in electron-molecule scattering and photoionization [DE84-012680] N84-32139

MOLECULAR ENERGY LEVELS
Microwave and far infrared spectroscopy of transient molecules [AD-A142962] N84-32134

MOLECULAR EXCITATION
Optical stark effect in the 2-photon spectrum of NO [NASA-TM-85964] N84-32131
Energy redistribution in diatomic molecules on surfaces [DE84-011442] N84-32213

MOLECULAR PHYSICS
USSR report: Physics and mathematics [JPRS-UPM-84-005] N84-32081

MOLECULAR RELAXATION
Plasma beam instability of bounded electron beam in weak magnetic field N84-32105

MOLECULAR ROTATION
A theoretical study of the energetics and dynamics of high energy inelastic collision processes [AD-A142799] N84-32163

MOLECULAR SPECTRA
Optical stark effect in the 2-photon spectrum of NO [NASA-TM-85964] N84-32131

MOLECULAR SPECTROSCOPY
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules [AD-A143017] N84-31303
Microwave and far infrared spectroscopy of transient molecules [AD-A142962] N84-32134

MOLECULAR STRUCTURE
Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging [DE84-010712] N84-32137

MOLECULAR WEIGHT
Effect of polydispersity on the cloud point curves of polymer mixtures
[AD-A143159] N84-31384

MOLECULES
Resonance ionization spectroscopy measurement of the vapor pressure of several molecular species
[DE84-010656] N84-31624
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Microwave and far infrared spectroscopy of transient molecules
[AD-A142982] N84-32134
Predictions of entropies of molecules and liquids
[DE84-010504] N84-32216

MOLTEN SALT ELECTROLYTES
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544

MOMENTUM TRANSFER
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE84-008935] N84-31572

MONOCHROMATORS
Apparatus based on holographic focusing diffraction grating for measurement of diffraction efficiency of three-dimensional image holograms N84-32068

MONOPROPELLANTS
Porous catalytic metal plate degeneration bed in a gas generator
[AD-D011078] N84-31407

MONTANA
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31618

MONTE CARLO METHOD
Numerical calculations in quantum field theories
[DE84-010892] N84-32217

MORPHOLOGY
One method of assessing the validity of organizational-systems modelling
[BLL-M-35605-(5828.4)] N84-32222

MOTIVATION
Psychophysiological aspects of monotonous human activity N84-31911
Sensitivity to hypoxia in humans N84-31934

MOTOR VEHICLES
USSR report: Transportation
[JPRS-UTR-84-024] N84-31119
Splash and spray from road vehicles and associated topics: A bibliography
[CAR-8425] N84-31557

MOUNTING
Double arch mirror study. Part 2: Engineering analysis report
[NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report
[NASA-CR-166589-PT-3] N84-31636
Double arch mirror study
[NASA-CR-166589] N84-31637

MULTIBEAM ANTENNAS
Moebius r-2R lens
[AD-P003511] N84-31479
RF design and performance of a multibeam, multiband antenna
[AD-P003512] N84-31480

MULTIPATH TRANSMISSION
Hoop/column antenna: RF verification model. Volume 1: Test results
[NASA-CR-172412] N84-31463

MULTIPHASE FLOW
Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces
[AD-A143041] N84-31355

MULTIPHOTON ABSORPTION
Optical stark effect in the 2-photon spectrum of NO
[NASA-TM-85964] N84-32131

MULTIPLEXING
Aircraft multiplexing system architecture and stores compatibility
[AD-P003530] N84-31134
Single chip MIL-STD-1553B bus interface unit keeps pace with chip sets
[AD-P003537] N84-31141
MIL-STD-1553: Testing and test equipment
[AD-P003545] N84-31149

MULTIPLICATION
Economical multiplication of Boolean equations N84-32079

MULTIPROCESSING (COMPUTERS)
Specifying the behavior of concurrent systems
[NASA-CR-173839] N84-31957

MULTIPROGRAMMING
Resource contention, synchronization, and information structure in distributed systems
[AD-A143037] N84-32287

MULTISPECTRAL BAND CAMERAS
BRESEX: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface
[NASA-CR-173673] N84-31271

MULTISPECTRAL BAND SCANNERS
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10179] N84-31750
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper
[E84-10180] N84-31751
Spectral characterization of the LANDSAT Thematic Mapper sensors
[E84-10184] N84-31755

MUSCLES
Modulation of the cholinergic mechanisms in the bronchial smooth muscle
[NDRE/PUBL-84-1001] N84-31937

MUSCULAR FUNCTION
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930

MUSCULOSKELETAL SYSTEM
Hypokinesia experiment studies effects of weightlessness N84-31234
Conference Grant for 2nd World Congress on Biomaterials
[AD-A143129] N84-31915

N

NAP-OF-THE-EARTH NAVIGATION
DMA and CIG: A shotgun wedding
[AD-P003459] N84-32236
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training
[AD-P003481] N84-32248

NARROWBAND
Investigation of statistical characteristics of random signals in nonlinear medium N84-32066

NASA PROGRAMS
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221
NASA patent abstracts bibliography, a continuing bibliography. Section 1: Abstracts (Supplement 25)
[NASA-SP-7039(25)-SECT-1] N84-32272

NASTRAN
Nonlinear displacement analysis of advanced propeller structures using NASTRAN
[NASA-TM-83737] N84-31683

NATURAL GAS
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417

NAVIER-STOKES EQUATION
A direct numerical method for the solution of unsteady Navier-Stokes equations in generalized orthogonal coordinates N84-31549
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations
[AD-A141634] N84-31564
Another attempt to overcome the bent element blues
[DE84-007785] N84-31571
Two-dimensional vapor flow analysis in heat pipes
[DE84-012581] N84-31582

NAVIGATION
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185

NAVIGATION AIDS
LANTIRN (Low Altitude Navigation and Targeting Infrared System for Night) - tommorrow's software development today
[AD-P003583] N84-31188

NEAR FIELDS
A dual-ported, dual-polarized spherical near-field probe
[AD-P003514] N84-31482

NEAR INFRARED RADIATION
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845

NEBULAE
Optical and infrared polarization as a probe of matter near stars N84-32324

NERVES
Modulation of the cholinergic mechanisms in the bronchial smooth muscle
[NDRE/PUBL-84-1001] N84-31937
Nonlinear dynamics in excitable nerve membranes N84-32037

NERVOUS SYSTEM
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature
[AD-A142961] N84-31912

NETWORK ANALYSIS
Automated Construction Management System (ACMS). Volume 1: User's guide
[AD-A143031] N84-31971
A physical database design methodology using the property of separability N84-32261

NEUTRAL BEAMS
Pulsed high-current source of negatively charged hydrogen ions
[DE84-012989] N84-32158
High power neutral beam heating on Doublet 3
[DE84-012471] N84-32186
Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-009865] N84-32191

NEUTRON IRRADIATION
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31783

NEVADA
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31829
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential
[DE84-012404] N84-31852

NEWTON-RAPHSON METHOD
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31686
3cil-adaptive solution strategies N84-31693

NEWTONIAN FLUIDS
Continuum theory for fiber suspensions
[DE84-012258] N84-31584

NICKEL
Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy
[DE84-009246] N84-31327
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83738] N84-31344
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523
Crack kinetics of the nickel-hydrogen system N84-31665

NICKEL ALLOYS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
Development of improved low-strain creep strength in Cabot alloy R-41 sheet — nickel base sheet alloy for reentry shielding
[NASA-CR-172392] N84-31346
Study of high performance alloy electroforming — nickel manganese and nickel cobalt manganese alloys
[NASA-CR-173865] N84-31350
Environment and fracture
[DE84-011454] N84-31360
A combined thermodynamic study of nickel-base alloys
[DE84-013467] N84-31368

NICKEL COATINGS
Adhesion between polymers and evaporated gold and nickel films
[NASA-TP-2360] N84-31379

NICKEL OXIDES
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210

NICKEL-IRON BATTERIES
Study of bipolar batteries
[DE84-013193] N84-31540

NIGHT
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597

NIGHT SKY
Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil
[INPE-3030-PRE/469] N84-31839
NIMBUS 7 SATELLITE
NIMBUS 7 Earth Radiation Budget (ERB) matrix user's guide. Volume 2: Tape specifications
[NASA-CR-170820] N84-31961
NIOBIUM
Far infrared optical properties of WbSe3
[DE84-009223] N84-32173
NITRAMINE PROPELLANTS
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
NITRATION
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
NITRIC OXIDE
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
Optical stark effect in the 2-photon spectrum of NO
[NASA-TM-85984] N84-32131
NITRO COMPOUNDS
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
NITROGEN COMPOUNDS
Gaseous cementation in nitrogen-methanol atmospheres
[CETIM-12-G-284] N84-31374
NITROGEN LASERS
A blackbody-pumped CO2-N2 transfer laser
[NASA-TP-2347] N84-31617
NITROSAMINE
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
NOISE (SOUND)
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Noise as a public health problem, volume 2
[AD-A142413] N84-31800
NOISE INTENSITY
Computation of the fluid-borne noise in hydrostatic systems and ways to decrease it
[BMFT-FB-HA-84-023] N84-31593
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
NOISE MEASUREMENT
Test rig for measuring hydraulic equipment noise
[CETIM-41-H-337] N84-31224
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732
Application of an adaptive noise technique on state estimation to data smoothing
[INPE-3187-PRE/552] N84-31963
Acoustic tests of the MOD-O/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83780] N84-32122
NOISE PREDICTION
Computation of the fluid-borne noise in hydrostatic systems and ways to decrease it
[BMFT-FB-HA-84-023] N84-31593
NOISE PREDICTION (AIRCRAFT)
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117
Analytical model of the structureborne interior noise induced by a propeller wake
[NASA-CR-172381] N84-32119
NOISE REDUCTION
Compressed air exhaust silencers, summary
[CETIM-11-H-275] N84-31650
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123
NOISE TEMPERATURE
Analysis of noise temperature of optical waveguide N84-31434
NONDESTRUCTIVE TESTS
Holographic test procedures for the evaluation of complicated material composites (tires)
[BMFT-FB-T-84-006] N84-31612
Nondestructive testing of bonding by ultrasonic analysis: Preliminary study report proposed investigation program — metal bonding
[CETIM-13-V-010] N84-31660
NONFERROUS METALS
Forging and stamping nonferrous metals. Handbook
[AD-A141689] N84-31351
NONLINEAR EQUATIONS
Global solutions for the one-dimensional equations of a viscous reactive gas
[AD-A142931] N84-31569
Self-adaptive solution strategies N84-31693
Extending normal mode initialization: A new method
[PB84-196435] N84-31685
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197
Nonlinear analysis of Stirling engine thermodynamics
[DE84-013493] N84-32219
NONLINEAR SYSTEMS
An adaptive attitude controller for terrestrial artificial satellites
[INPE-3186-PRE/551] N84-31243
Transition bifurcation branches in non-linear water waves
[CAR-8418] N84-31556
Nonlinear theory of the free-electron laser
[INPE-3193-PRE/557] N84-31618
The response of nonlinear structures to random excitation N84-31678
Nonlinear displacement analysis of advanced propeller structures using NASTRAN
[NASA-TM-83737] N84-31683
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31686
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
A shear deformable shell element for laminated composites N84-31691
Nonlinear finite element analysis of shells with large aspect ratio N84-31692
Element-by-element solution procedures for nonlinear structural analysis N84-31694
Interactive finite elements for general engine dynamics analysis N84-31696
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM)
[AD-A143170] N84-31974
PLTMGC: A multi-grid continuation program for parameterized nonlinear elliptic systems
[DE84-010406] N84-32017
NONLINEARITY
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Vibrations and stability of mechanical ystems, 3 N84-31681
Globally convergent procedures for solving nonlinear minimization problems
[AD-A142905] N84-32009
Research in nonlinear motion
[AD-A143000] N84-32013
Nonlinear dynamics in excitable nerve membranes N84-32037
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074
Cooling of seminfinite body under conditions of nonlinear heat transfer at surface N84-32075
Sequential method of minimizing nonlinear function on simplex N84-32080
Investigation of statistical characteristics of random signals in nonlinear medium N84-32086
Propagation of nonlinear compression pulses through granular media N84-32106
NONUNIFORM FLOW
Mathmatical modeling of longitudinal profile adjustment in alluvial streams N84-31726
NORMALITY
Extending normal mode initialization: A new method
[PB84-196435] N84-31685
NORTH ATLANTIC TREATY ORGANIZATION (NATO)
Calendar of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341
NORTH CAROLINA
The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815
NOTCH TESTS
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading
[NASA-CR-3815] N84-31290
NUCLEAR ELECTRIC POWER GENERATION
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
NUCLEAR EXPLOSION EFFECT
A technique for simulating conduction interference created by electromagnetic pulses (EMP)
[SNIAS-841-422-104] N84-31502
Calculation of low altitude electromagnetic pulses in the first moments — after a nuclear explosion
[SNIAS-841-422-105] N84-31503
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
Coupling of electromagnetic pulses created by a nuclear explosion on the ground with overhead power cables
[SNIAS-841-422-107] N84-31505
Calculation of electromagnetic fields on the surface of and inside cavities — nuclear explosion effects
[SNIAS-841-422-108] N84-31506
NUCLEAR FUEL REPROCESSING
Advanced remotely maintainable force-reflecting servomanipulator concept
[DE84-011634] N84-31646
NUCLEAR FUELS
Space reactor fuels performance and development issues
[DE84-011414] N84-32164
NUCLEAR FUSION
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
Three-dimensional model for fusion processes
[DE84-011731] N84-32339
NUCLEAR MAGNETIC RESONANCE
Nuclear Magnetic Resonance (NMR) study of glass fiber-epoxy resin composites in the solid state N84-31299
A study of a two-frequency NMR maser N84-31615
NUCLEAR PHYSICS
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Applied chromodynamics
[DE84-009136] N84-32152
NUCLEAR WEAPONS
Lower confidence bounds on system reliability using component data: Maximum methodology
[DE84-012813] N84-31658
NULL ZONES
Effect of spatial decorrelation on nulling performance of linear adaptive array
[AD-A143013] N84-31570
NUMBER THEORY
Some observations concerning the zero-curves of the real and imaginary parts of Riemann's zeta function
[MC-ZW-201/83] N84-32030
NUMERICAL ANALYSIS
A direct numerical method for the solution of unsteady Navier-Stokes equations in generalized orthogonal coordinates N84-31549
Bi- and poly-optimal confidence limits for a location and parameter
[AD-A142960] N84-32012
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1
[AD-A143065] N84-32015
Resonances in electron-molecule scattering and photoionization
[DE84-012660] N84-32139
NUMERICAL CONTROL
Digital control system for space structural dampers
[NASA-CR-173867] N84-31267
Basis research on intelligent robotic systems operating in hostile environments: New developments at ORNL
[DE84-011464] N84-31647
Study of numerical control systems for machines. Integration in flexible workshops and units
[CETIM-1.3T.042] N84-31991
Modern control techniques for accelerators
[DE84-012521] N84-32140
Phase and amplitude control system for Stanford Linear Accelerator
[DE84-011773] N84-32156
NUMERICAL DATA BASES
Directory of computerized data files, 1984
[PB84-160126] N84-32303
NUTS (FASTENERS)
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639

O

OBLIQUE SHOCK WAVES
Nonstationary oblique-shock-wave reflections in air [UTIAS-270] N84-31562
OBLIQUENESS
Focusers of obliquely incident laser radiation N84-32099
OCCULTATION
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331
OCEAN BOTTOM
A pioneer deep ocean mining venture [PB84-199645] N84-31780
Convergence tectonics of the Peru Trench: 8 deg S - 15 deg S latitude N84-31824
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean [AD-A142873] N84-31850
Deep-Towed Array Geophysical System (DTAGS): A hardware description [AD-A142970] N84-31851
OCEAN CURRENTS
Large-scale atmosphere-ocean coupling [AD-A143162] N84-31873
Expendable current profiler (XCP, Mod 7) [AD-A142936] N84-31897
OCEAN SURFACE
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil [INPE-3214-PRE/567] N84-31867
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts [PB84-190487] N84-31900
OCEAN TEMPERATURE
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil [INPE-3214-PRE/567] N84-31867
OCEANOGRAPHIC PARAMETERS
Practical applications of a space station [NASA-CR-173672] N84-31270
OCEANOGRAPHY
A pioneer deep ocean mining venture [PB84-199645] N84-31780
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean [AD-A142873] N84-31850
Deep-Towed Array Geophysical System (DTAGS): A hardware description [AD-A142970] N84-31851
Environmental Research Laboratories publication abstracts, FY 1983 [PB84-186323] N84-31892
South Atlantic physical oceanography study (year 5). Volume 1: Executive summary [PB84-187855] N84-31899
An ocean climate research strategy [PB84-194828] N84-31902
European scientific notes, volume 38, no. 5 [AD-A141713] N84-32285
Key to oceanographic records documentation [PB84-186360] N84-32299
OCEANS
A pioneer deep ocean mining venture [PB84-199645] N84-31780
Deep-Towed Array Geophysical System (DTAGS): A hardware description [AD-A142970] N84-31851
Large-scale atmosphere-ocean coupling [AD-A143162] N84-31873
OKLAHOMA
Measurements inside Oklahoma thunderstorms [PB84-206911] N84-31891
ON-LINE PROGRAMMING
An on-line equivalent system identification scheme for adaptive control N84-31213
User friendly authoring languages: An alternative approach [AD-P003461] N84-32238
NLM (National Library of Medicine) Online Services Reference Manual: Supplement [PB84-186808] N84-32300
ON-LINE SYSTEMS
The user's mental model of an information retrieval system: Effects on performance N84-32275
NLM (National Library of Medicine) Online Services Reference Manual: Supplement [PB84-186808] N84-32300
ONBOARD DATA PROCESSING
MIL-STD-1750A as a spaceborne instruction set architecture [AD-P003554] N84-31158
OPERATING SYSTEMS (COMPUTERS)
The Ada (Trademark) run-time environment [AD-P003558] N84-31182
Reliability analysis of an ultra-reliable fault tolerant control system [NASA-CR-166594] N84-31219
OPERATIONS RESEARCH
Abstraction, specification and implementation techniques with an application to garbage collection — data processing [MATH-CENTRE-TRACTS-166] N84-31980
OPERATORS (MATHEMATICS)
Finite dimensional compensators for infinite dimensional systems with unbounded control action [AD-A142808] N84-32002
Spline approximation for retarded systems and the Riccati equation [AD-A142963] N84-32010
OPERATORS (PERSONNEL)
Improving comfort of welders by reducing preheating temperatures — steel welding [CETIM-12-Y-413] N84-31851
Results of psychophysiological study of Videoton terminal operators N84-31919
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31927
Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929
OPHTHALMOLOGY
Ophthalmological investigation among contact lens wearers in military service [REPT-AR/MHAM-1983-1] N84-31940
OPTICAL ACTIVITY
Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging [DE84-010712] N84-32137
OPTICAL COUNTERMEASURES
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association [AD-A143157] N84-31406
OPTICAL DATA PROCESSING
Modular image analysis system [BMFT-FB-T-84-074] N84-32177
OPTICAL DENSITY
Optical density radiation dose relationship — radiography [CETIM-100880] N84-32162
OPTICAL EQUIPMENT
Temperature controlled adjusting mechanism [AD-D011077] N84-31601
Front lighted optical tooling method and apparatus [DE84-011108] N84-31602
New type of dye laser with light-induced distributed feedback N84-32067
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology [BMFT-FB-T-84-094] N84-32178
OPTICAL FILTERS
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
OPTICAL MEASUREMENT
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope [NASA-CR-171133] N84-32168
Mie scattering as a technique for the sizing of air bubbles [AD-A142737] N84-32170
Measurement of multimode optical fiber attenuation: An NBS special test service [PB84-192202] N84-32179
OPTICAL MEASURING INSTRUMENTS
Front lighted optical tooling method and apparatus [DE84-011108] N84-31602
OPTICAL PATHS
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope [NASA-CR-171133] N84-32168
OPTICAL PROPERTIES
Improvement in quality of silicon-based amorphous films N84-32041
Far infrared optical properties of WbSe3 [DE84-009223] N84-32173
Microstructural stability of copper electroplate [DE84-010070] N84-32174
Two probable optical flashes from gamma-ray bursters [NASA-TM-86126] N84-32337
OPTICAL PUMPING
Optically pumped polarized alkali atomic beams and targets [DE84-012389] N84-32147
OPTICAL RADAR
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31807
Double scattering background in a CW lidar N84-32072
OPTICAL REFLECTION
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
OPTICAL WAVEGUIDES
Analysis of noise temperature of optical waveguide N84-31434
Measurement of multimode optical fiber attenuation: An NBS special test service [PB84-192202] N84-32179
OPTICS
Short wavelength optics for future free electron lasers [DE84-012316] N84-31828
USSR report: Physics and mathematics [JPRS-UPM-84-005] N84-32081
Focusers of obliquely incident laser radiation N84-32099
OPTIMAL CONTROL
Adaptive multibeam antenna array N84-31430
Optimum control of electric motor drives for industrial robots [DE84-012878] N84-31543
Directional convexity and finite optimality conditions [AD-A141698] N84-32000
OPTIMIZATION
Object code optimization in a standard compiler [AD-P003520] N84-31124
A computerized system for establishing electric-vehicle battery requirements [DE84-011728] N84-31545
Nonlinear inverse methods applied to interpreting gravity anomalies produced by multi-interfaced geologic bodies N84-31822
Investigation of criteria enabling a two-dimensional grid to evolve while minimizing errors [CETIM-100980] N84-31982
Directional convexity and finite optimality conditions [AD-A141698] N84-32000
Globally convergent procedures for solving nonlinear minimization problems [AD-A142905] N84-32009
Bi- and poly-optimal confidence limits for a location and parameter [AD-A142980] N84-32012
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1 [AD-A143085] N84-32015
Strong confidence intervals: A compromise between the Gaussian and the slash [AD-A142981] N84-32021
Sequential method of minimizing nonlinear function on simplex N84-32080
Logical optimization for database uniformization [NASA-CR-173836] N84-32262
ORBIT CALCULATION
Angles-only, ground-based, initial orbit determination [AD-A142994] N84-31241
ORBITAL MECHANICS
Reentry analysis [DE84-012640] N84-32167
ORBITAL POSITION ESTIMATION
Angles-only, ground-based, initial orbit determination [AD-A142994] N84-31241
State estimation and parameter identification: An approach involving a pair consisting of the initial state and the trajectory [INPE-3163-PRE/548] N84-31995
ORBITAL SERVICING
Spacecraft servicing demonstration plan [NASA-CR-171132] N84-31258
On orbit surfacing of thermal control surfaces [NASA-CR-171121] N84-31266
ORBITAL SPACE STATIONS
Practical applications of a space station [NASA-CR-173672] N84-31270
ORBITS
Angles-only, ground-based, initial orbit determination [AD-A142994] N84-31241
Optimization of the capture process for a rigid satellite stabilized by gravity gradient [INPE-3184-PRE/549] N84-31245
Reentry analysis [DE84-012640] N84-32167
ORGANIC COMPOUNDS
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040

ORGANIZATIONS
Polar research board report, 1983 and future plans
[PB84-194315] N84-31779
One method of assessing the validity of organizational-systems modelling
[BLL-M-36806-(5838.4)] N84-32222
Guide to programs, fiscal year 1984: Guide describing National Science Foundation programs and activities
[PB84-193226] N84-32270
EPA (Environmental Protection Agency) journal holdings report, 1983
[PB84-194877] N84-32304
ORGANOMETALLIC COMPOUNDS
Laser induced polymerization reactions in solid propellant binders N84-31403
ORTHOPEDICS
Conference Grant for 2nd World Congress on Biomaterials
[AD-A143129] N84-31915
OSCILLATING FLOW
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018
Supersonic jet-cavity interaction pulsation N84-32080
OSCILLATIONS
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-006550] N84-31579
Temperature oscillations and ozone correlations in the lower stratosphere of Natal (6 deg S)
[INPE-3116-PRE/512] N84-31844
Large-scale atmosphere-ocean coupling
[AD-A143162] N84-31873
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Nonlinear dynamics in excitable nerve membranes N84-32037
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics N84-32052
Oscillations of elastic airplane due to wind gust N84-32087
Non-integrability of planar oscillation equation for satellite in elliptical orbit N84-32109
OSCILLATORS
Picosecond parametric optical oscillator with amplification of radiation from tunable semiconductor laser N84-32097
OUTPUT
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem
[NASA-CR-3629] N84-31217
OXIDATION
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83736] N84-31344
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142909] N84-31381
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009867] N84-32215
OXIDES
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy
[AD-A142059] N84-31702
OXYGEN
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Atomic carbon in the Venus thermosphere: Observations and theory N84-32332
OXYGEN ATOMS
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173673] N84-32130
OXYGEN CONSUMPTION
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923
OXYGEN METABOLISM
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923
OXYGENATION
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923
OZONE
A modified standard method for the determination of ozone residual concentration by spectrophotometry
[PB84-204684] N84-31335
US EPA (Environmental Protection Agency) regional oxidant model, background and overview
[PB84-201680] N84-31806
Temperature oscillations and ozone correlations in the lower stratosphere of Natal (6 deg S)
[INPE-3116-PRE/512] N84-31844
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31856
Geophysical monitoring for climatic change Number 11,
[PB84-181841] N84-31883

P

P-I-N JUNCTIONS
P-I-N Diode Switches Project
[INPE-3171-PRE/541] N84-31516
PACIFIC OCEAN
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts
[PB84-190467] N84-31900
PAIN
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58262] N84-31935
PAIR PRODUCTION
Electromagnetic effects in strong field of single crystals N84-32084
PAKISTAN
Space research in Pakistan: A relentless pursuit N84-31227
PALEOMAGNETISM
Geochronology, paleomagnetism and petrology of the Upper Cenozoic Bruneau Formation in the Western Snake River Plain, Idaho N84-31826
PALEONTOLOGY
Geology, petrology and tectonic significance of the Mesozoic Paleocenic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
PALLADIUM
In-situ TEM investigations of graphic-epitaxy and small particles
[NASA-CR-166593] N84-32201
PANELS
Characterization and degradation studies on synthetic polymers for aerospace application
[NASA-CR-166597] N84-31284
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft
[NASA-CR-172344] N84-31287
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31708
PARABOLIC ANTENNAS
Phase light range finder N84-31447
Hoop/column antenna RF verification model. Volume 2: Analysis and correlation
[NASA-CR-172413] N84-31462
RF design and performance of a multibeam, multiband antenna
[AD-P003512] N84-31480
Synthesis of offset dual shaped subreflector antennas for control of Cassegrain aperture distributions
[AD-P003517] N84-31485
The nonlinear dynamics of spinning paraboloidal antennas N84-32033
PARABOLIC REFLECTORS
Solar thermal parabolic dish systems: Technology and applications
[DE84-012239] N84-31792
PARABOLOID MIRRORS
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32128
PARACHUTES
The Project STRAFAM: Test of a new parachute based instrument carrier for stratospheric research — dropsondes
[BMFT-FB-W-84-021] N84-31859
PARALLEL PROCESSING (COMPUTERS)
Princeton VLSI project
[AD-A142950] N84-31521
PARAMETER IDENTIFICATION
Unsteady aerodynamics of fast moving control surfaces
[BMFT-FB-W-84-020] N84-31117
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31290
Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces
[AD-A143041] N84-31365
State estimation and parameter identification: An approach involving a pair consisting of the initial state and the trajectory
[INPE-3183-PRE/548] N84-31995
PARAMETERIZATION
Positive displacement compounding of a heavy duty diesel engine
[NASA-CR-166286] N84-31841
Bi- and poly-optimal confidence limits for a location and parameter
[AD-A142990] N84-32012
Strong confidence intervals: A compromise between the Gaussian and the slash
[AD-A142981] N84-32021
PARITY
Usual initial and final state effects in quantum chromodynamics
[DE84-010422] N84-32148
PARTIAL DIFFERENTIAL EQUATIONS
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31098
Global solutions for the one-dimensional equations of a viscous reactive gas
[AD-A142931] N84-31569
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142996] N84-32007
Fundamental research in applied mathematics
[AD-A143123] N84-32016
PARTIAL PRESSURE
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210
PARTICLE ACCELERATION
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073
PARTICLE ACCELERATOR TARGETS
Engineering basis for selection of positron source material
[DE84-011772] N84-32143
PARTICLE ACCELERATORS
Modern control techniques for accelerators
[DE84-012521] N84-32140
Using ions to probe the transverse size of a bunch
[DE84-012772] N84-32141
Design fabrication and testing of the BNL radio frequency quadrupole accelerator
[DE84-011915] N84-32145
Further effects of ions in the arcs
[DE84-011761] N84-32149
PARTICLE BEAMS
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184
PARTICLE COLLISIONS
Future accelerators using micro-fabrication technology
[DE84-002692] N84-32157
PARTICLE INTERACTIONS
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Usual initial and final state effects in quantum chromodynamics
[DE84-010422] N84-32148
PARTICLE MOTION
Theoretical studies of the pulsar magnetosphere N84-31809
DYNA3D user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1
[DE84-012828] N84-31979
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083
Propagation of nonlinear compression pulses through granular media N84-32108
PARTICLE SIZE DISTRIBUTION
Total aerosol volume computed from laser spectrometer particle-size data for comparison with flame photometer total-mass data
[AD-A143171] N84-31306
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174836] N84-31595
PARTICULATE SAMPLING
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333

PASCAL (PROGRAMMING LANGUAGE)
PAS/NEB: A PASCAL language tool for the MCF (Military Computer Family)
[AD-P003535] N84-31139
PASSENGERS
Report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A143023] N84-31103
PASSIVITY
IUE observations of variable type I Seyfert galaxies N84-31781
PATENT APPLICATIONS
NASA patent abstracts bibliography, a continuing bibliography. Section 1: Abstracts (Supplement 25)
[NASA-SP-7039(25)-SECT-1] N84-32272
PATENTS
NASA patent abstracts bibliography, a continuing bibliography. Section 1: Abstracts (Supplement 25)
[NASA-SP-7039(25)-SECT-1] N84-32272
PATTERN RECOGNITION
Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31782
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31926
PATTERNS
Conformal array analysis
[AD-P003504] N84-31472
PAVEMENTS
Multi-variate acceptance plans for flexible airport pavements N84-31220
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-000591] N84-32165
PENNING DISCHARGE
Dual arc penning ion source gas flow experiments
[DE84-011637] N84-32151
PERCEPTION
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
PERFORMANCE PREDICTION
Feasibility study of a low cost Energy Performance Management System (EPMS) — automatic flight control
[BMFT-FB-W-84-015] N84-31116
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
PERFORMANCE TESTS
Advanced system for testing new helicopter transmissions N84-31120
MIL-STD-1553B validation testing
[AD-P003544] N84-31148
MIL-STD-1553: Testing and test equipment
[AD-P003545] N84-31149
MIL-STD-1750A verification testing
[AD-P003555] N84-31159
Laboratory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment
[PB84-182146] N84-31426
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31484
A dual-ported, dual-polarized spherical near-field probe
[AD-P003514] N84-31482
Performance and test criteria for dc fuses, phase 1
[PB84-202662] N84-31548
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639
Two years experience testing solar collectors in Brazil
[INPE-3221-RPE/461] N84-31785
Guidelines for testing and release procedures
[NASA-CR-166581] N84-31962
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
PERIODIC VARIATIONS
Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327
PERIODICALS
EPA (Environmental Protection Agency) journal holdings report, 1983
[PB84-194877] N84-32304
PERMEABILITY
Effects of microwaves on cell membrane permeability
[AD-A142979] N84-31913
PERMITTIVITY
Properties of polymers: Some uses in electronics, part two
[DE84-012864] N84-31367
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
PERSONNEL
Ophthalmological investigation among contact lens wearers in military service
[REPT-AR/MHAM-1983-1] N84-31940
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32268
PERSONNEL DEVELOPMENT
Ada (Trademark) training considerations
[AD-P003560] N84-31164
Guide to computer-based training
[DE84-012244] N84-31975
Practical writing and editing techniques
[DE84-012642] N84-32294
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295
PERSONNEL MANAGEMENT
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
Equitable assignment rules
[AD-A142809] N84-32268
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295
PERSONNEL SELECTION
Realization of human work capacity: Interdisciplinary problems N84-31920
PERTURBATION
Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion
[NASA-CR-3822] N84-31218
Assessment of local influence
[AD-A143002] N84-32014
Propagation of nonlinear compression pulses through granular media N84-32108
Applied chromodynamics
[DE84-009136] N84-32152
PETROGRAPHY
Petrography and depositional environment of the Herrin (no. 6) seam in central, eastern and northwestern Illinois N84-31813
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31816
PETROLOGY
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31818
Geochronology, paleomagnetism and petrology of the Upper Cenozoic Bruneau Formation in the Western Snake River Plain, Idaho N84-31826
PHASE CONJUGATION
Preliminary experiments on phase conjugation for flow visualization — barium titanate single crystals
[NASA-TM-83766] N84-32169
PHASE CONTROL
Phase and amplitude control system for Stanford Linear Accelerator
[DE84-011773] N84-32156
PHASE ERROR
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
PHASE MODULATION
The application of convolutional codes to continuous phase modulated communication channels N84-31457
Phase modulator in 41.650 MHz
[INPE-3177-PRE/544] N84-31515
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123
PHASE SHIFT
Microwave phase modulators using semiconductor diodes (survey) N84-31448
PHASE SHIFT KEYING
Performance of digital communications over selective fading channels N84-31456
PHASE TRANSFORMATIONS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340
The effects of internal stress and phase transformations on fracture N84-31671
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214
PHASED ARRAYS
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
Conformal array analysis
[AD-P003504] N84-31472
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477
PHILIPPINES
Origin and evolution of the West Philippine Basin N84-31820
PHOBOS
Phobos: Close encounter imaging from the Viking Orbiters
[NASA-RP-1109] N84-32330
PHONONS
Nonequilibrium optical and acoustic phonons in semiconductors N84-32085
PHOSPHORUS COMPOUNDS
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
CO2 laser decomposition of the alkyl phosphites N84-31402
PHOTOCHEMICAL OXIDANTS
US EPA (Environmental Protection Agency) regional oxidant model, background and overview
[PB84-201680] N84-31806
PHOTOCHROMISM
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038
PHOTOCONDUCTIVITY
Improvement in quality of silicon-based amorphous films N84-32041
PHOTOCONDUCTORS
Crystalline photoconductive films for electrophotographic recording
[BMFT-FB-T-84-099] N84-31814
PHOTODIODES
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-008034] N84-32206
PHOTODISSOCIATION
Catalyzed photodissociation of water
[DE84-012253] N84-31325
PHOTOELASTIC ANALYSIS
Newly discovered effect of interaction of optical radiation and glass N84-32069
PHOTOELECTRIC CELLS
Apparatus based on holographic focusing diffraction grating for measurement of diffraction efficiency of three-dimensional image holograms N84-32068
PHOTOELECTRON SPECTROSCOPY
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules
[AD-A143017] N84-31303
Resonance ionization spectroscopy measurement of the vapor pressure of several molecular species
[DE84-010656] N84-31624
Triply differential studies of atomic and molecular photoionization using synchrotron radiation
[AD-A142834] N84-32133
PHOTOELECTRONS
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
Triply differential studies of atomic and molecular photoionization using synchrotron radiation
[AD-A142834] N84-32133
PHOTOGEOLOGY
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[E84-10189] N84-31760

PHOTOGRAMMETRY
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725
PHOTOGRAPHIC RECORDING
Crystalline photoconductive films for electrophotographic recording
[BMFT-FB-T-84-099] N84-31614
PHOTOGRAPHIC TRACKING
Automatic camera tracking for remote manipulators
[DE84-011455] N84-31606
PHOTOINTERPRETATION
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[E84-10186] N84-31760
PHOTOIONIZATION
Absolute photoionization cross sections of atomic oxygen
[NASA-CR-173873] N84-32130
Triply differential studies of atomic and molecular photoionization using synchrotron radiation
[AD-A142834] N84-32133
Resonances in electron-molecule scattering and photoionization
[DE84-012660] N84-32139
PHOTOLITHOGRAPHY
Development of thermionic integrated circuits for applications in hostile environments
[DE84-011374] N84-31533
PHOTOLYSIS
Catalyzed photodissociation of water
[DE84-012253] N84-31325
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Laser-assisted solar cell metallization processing
[NASA-CR-173875] N84-31619
PHOTOMETERS
Total aerosol volume computed from laser spectrometer particle-size data for comparison with flame photometer total-mass data
[AD-A143171] N84-31306
PHOTOMETRY
Analytical methods for determination of inorganic anions
[BLL-WH-582-(9091.9F)] N84-31301
PHOTON BEAMS
New approaches to photothermal spectroscopy
[DE84-009237] N84-31310
PHOTONICS
A multi-GHz multi-channel photonic analog data processing system
[DE84-012261] N84-32175
PHOTONS
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
PHOTOPRODUCTION
Electromagnetic effects in strong field of single crystals N84-32064
PHOTOSPHERE
The shape of the Sun N84-32334
PHOTOTHERMAL CONVERSION
New approaches to photothermal spectroscopy
[DE84-009237] N84-31310
PHOTOVOLTAGES
A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010978] N84-31797
PHOTOVOLTAIC CELLS
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
Photovoltaics: The endless spring
[NASA-TM-83684] N84-31782
Superlattice structures grown by molecular beam epitaxy
[DE84-011286] N84-32209
PHOTOVOLTAIC CONVERSION
Activities at the Brookhaven National Laboratory integrated test bed for advanced hydrogen technology
[DE84-010226] N84-31408
SERI photovoltaics advanced research and development: FY 1983 accomplishments
[DE84-004493] N84-31789
PHYSICAL EXERCISE
Effect of body temperature on human work capacity N84-31926
PHYSICAL FITNESS
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
PHYSIOLOGICAL EFFECTS
USSR report: Space
[JPRS-USP-84-004] N84-31226
Medical research in first 100 days of Salyut-7 flight N84-31230
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232
Hypokinesis experiment studies effects of weightlessness N84-31234
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Noise as a public health problem, volume 2
[AD-A142413] N84-31800
Stability of physiological and psychological human functions under extreme environmental conditions N84-31910
First mixed crew in space N84-31917
Realization of human work capacity: Interdisciplinary problems N84-31920
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922
Pharmacologic counter measures minimizing post-space flight orthostatic intolerance — bed rest, drug disposition, and physiological function
[NASA-CR-173861] N84-31936
PHYSIOLOGICAL RESPONSES
Age-related responses to de- and hyperhydration N84-31905
Effects of whole-body cold exposure on erythrocyte morphology N84-31906
Effects of climate on kininogen levels in healthy human subjects N84-31907
Heart rhythm changes in response to sensorimotor load of varying complexity N84-31908
Variability of practice and the transfer of training of motor skills
[AD-A142896] N84-31942
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A142919] N84-31947
PICOSECOND PULSES
Picosecond parametric optical oscillator with amplification of radiation from tunable semiconductor laser N84-32097
PIEZOELECTRICITY
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
PIEZORESISTIVE TRANSDUCERS
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-173860] N84-31596
PILOT PERFORMANCE
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
Pilot oriented performance measurement
[AD-P003450] N84-32227
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003466] N84-32243
PILOT TRAINING
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228
Visual cueing effectiveness: Comparison of perception and flying performance
[AD-P003458] N84-32235
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261
PIPE FLOW
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-006550] N84-31579
Ammonia boiling in long tubes. Heat transfer and charge loss in vertical and horizontal tubes
[CETIM-14-C-011] N84-31588
PIPELINING (COMPUTERS)
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
PIPER AIRCRAFT
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117
PIPES (TUBES)
Study of different welded nipples in headers
[CRIF-MT-159] N84-31655
Slideline verification for multilayer pressure vessel and piping analysis including tangential analysis
[DE84-004333] N84-31711
Micrometric cleaning of steel tubes through ultrasonic cavitation
[REPT-61584] N84-32125
PISTON ENGINES
Nonlinear analysis of Stirling engine thermodynamics
[DE84-013493] N84-32219
PLANAR STRUCTURES
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
Conformal array analysis
[AD-P003504] N84-31472
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
Solution of some additional electromagnetic problems by the discrete convolution method
[AD-A143056] N84-31493
PLANE STRAIN
Role of texture and structural damage in plane strain deformation processing N84-31664
PLANE WAVES
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491
Acoustic propagation in a ternally stratified atmosphere
[NASA-CR-173863] N84-32121
PLANETARY MAGNETIC FIELDS
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331
PLANETARY WAVES
Conservation laws of wave action and potential enstrophy for Rossby waves in a stratified atmosphere
[NASA-TM-86058] N84-31838
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts
[PB84-190487] N84-31900
PLANNING
Planning of operational software implementation tool
[AD-P003595] N84-31200
PLANTS (BOTANY)
The use of aquatic plants to purify waste water in recreational waters
[REPT-226] N84-31805
PLASMA CONTROL
High power neutral beam heating on Doublet 3
[DE84-012471] N84-32186
Azimuthal electric fields and tandem ambipolarity
[DE84-010843] N84-32189
Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-006855] N84-32191
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198
PLASMA DENSITY
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
Protective plasma envelope
[DE84-013316] N84-32194
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198
PLASMA DIAGNOSTICS
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
PLASMA GENERATORS
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
PLASMA HEATING
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517
Electromagnetic theory of an antenna for ICR heating of a plasma in Tokamaks
[DE84-012988] N84-32200
PLASMA JETS
A review of anode phenomena in vacuum arcs
[DE84-012371] N84-31547
Plasma discharge elemental detector for a mass spectrometer
[DE84-011078] N84-31604

PLASMA OSCILLATIONS
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074

PLASMA PHYSICS
USSR report: Physics and mathematics [JPRS-UPM-84-003] N84-32043
USSR report: Physics and mathematics [JPRS-UPM-84-005] N84-32061

PLASMA PINCH
High density Z pinch as a small low-energy fusion device [DE84-009992] N84-32196
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch [DE84-009996] N84-32199

PLASMA RESONANCE
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074

PLASMA SPRAYING
Failure analysis of plasma-sprayed thermal barrier coatings [NASA-TM-83777] N84-31347

PLASMA TEMPERATURE
How useful are odd-integer half-harmonics [DE84-012392] N84-32190

PLASMAS (PHYSICS)
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma [INPE-3206-PRE/564] N84-31244
Research Reports of the Faculty of Engineering, no. 31 [DEC/1983/31] N84-32034
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Heat transfer by radiation in hydrogen plasma N84-32106
Second harmonic electron cyclotron emission studies of Tokapole-2 plasmas [DE84-013103] N84-32193

PLASMONS
A new model of Raman spectra in laser produced plasma [DE84-009625] N84-32188

PLASTERS
Response of a plaster-wood room subjected to simulated sonic booms [UTIAS-276] N84-31701

PLASTIC DEFORMATION
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2 [BLL-M-35595-(5828.4)] N84-31337
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys [AD-A143164] N84-31356
The effect of finite rotation on a problem in plastic deformation [DE84-012627] N84-31710

PLASTIC PROPERTIES
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672
Simplified approach to two-dimensional cyclic plasticity problems [CETIM-11-B-110] N84-31718

PLASTICS
Computer-Aided Engineering (CAE) in plastics technology [CSIR-TRANS-1725] N84-31380

PLATES
A shear deformable shell element for laminated composites N84-31691
Nonlinear finite element analysis of shells with large aspect ratio N84-31692

PLATES (STRUCTURAL MEMBERS)
Modal parameter estimation via shaker versus speaker excitation [DE84-012897] N84-31223
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668
Compound strip methods for the analysis of continuous elastic plates N84-31670
Temperature derivatives of elastic stiffnesses and frequency-temperature behavior of quartz crystal plates N84-31675

PLATES (TECTONICS)
Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819
Convergence tectonics of the Peru Trench: 8 deg S - 15 deg S latitude N84-31824
Seismological studies of the continental lithosphere [PB84-194752] N84-31862

PLATING
Electroless-plating technique for fabricating thin-wall convective heat-transfer models [NASA-TP-2349] N84-31561

PLOTTING
METLIB-2: A program library for calculating and plotting atmospheric and oceanic fields [PB84-205434] N84-31890

PNEUMATIC CIRCUITS
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590

PNEUMATIC EQUIPMENT
Automation of a stamping press using sequential hydraulic manipulators [CETIM-1-4N-090] N84-31422

POINT DEFECTS
Point defects and diffusion mechanisms in the monoxides of the iron-group metals [DE84-012105] N84-32210
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope [DE84-013423] N84-32214

POINT SOURCES
Acoustic propagation in a termally stratified atmosphere [NASA-CR-173883] N84-32121

POINT SPREAD FUNCTIONS
Characterization of the LANDSAT sensors' spatial responses [E84-10171] N84-31734

POINTING CONTROL SYSTEMS
Attitude determination using strapdown inertial sensors and adaptive estimation [INPE-3180-PRE/545] N84-31106

POINTS
Effect of polydispersity on the cloud point curves of polymer mixtures [AD-A143159] N84-31384

POISONING (REACTION INHIBITION)
Chemical poisoning in model heterogeneous reactions [DE84-012461] N84-31315

POLAR REGIONS
Polar research board report, 1983 and future plans [PB84-194315] N84-31779

POLARIZATION
Properties of polymers: Some uses in electronics, part two [DE84-012884] N84-31387
Optical and infrared polarization as a probe of matter near stars N84-32324
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation [NASA-TM-86131] N84-32333

POLARIZATION (WAVES)
Front lighted optical tooling method and apparatus [DE84-011108] N84-31602
Linear polarization and total flux density of silicon monoxide masers and active extragalactic objects at millimeter wavelengths N84-32314

POLARIZED RADIATION
Theoretical models for the polarization of astronomical masers N84-32313

POLICIES
DMA (Defense Mapping Agency) policy for digital MC and G (Mapping, Charting, and Geodesy) support of advanced systems [AD-A142748] N84-31765
Long term policy planning concerning Harderbos (Netherlands) [REPT-178] N84-31777
Classification management. Journal of the national classification management society, volume 19, 1983 [AD-A143015] N84-32286

POLISHING
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology [BMFT-FB-T-84-094] N84-32178

POLLUTION TRANSPORT
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31728
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825

POLOIDAL FLUX
Disruptive instabilities in a poloidal divertor tokamak [DE84-013054] N84-32192

POLYCRYSTALS
IUE observations of variable type I Seyfert galaxies N84-31781
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110

POLYETHYLENES
Adhesion between polymers and evaporated gold and nickel films [NASA-TP-2360] N84-31379

POLYMER CHEMISTRY
Viscoelastic and aging characteristics of polymers [DE84-012699] N84-31393
Calorimetric and thermogravimetric analysis applied to industrial polymers [SNIAS-841-551-101] N84-31399

POLYMER MATRIX COMPOSITES
Calorimetric and thermogravimetric analysis applied to industrial polymers [SNIAS-841-551-101] N84-31399

POLYMERIZATION
Properties of polymers: Some uses in electronics, part 1 [DE84-012883] N84-31386
Laser Induced Chemistry. 1984 JPM Specialist Session [AD-A142922] N84-31400
Laser induced polymerization reactions in solid propellant binders N84-31403
Differential scanning calorimeter data acquisiton system [AD-A143118] N84-31600

POLYMERS
Dielectric cure monitoring: Preliminary studies [NASA-TM-86452] N84-31378
Effect of polydispersity on the cloud point curves of polymer mixtures [AD-A143159] N84-31384
Properties of polymers: Some uses in electronics, part two [DE84-012884] N84-31387
Dynamic overstresses in fibrous polymeric materials [DE84-012605] N84-31394

POLYNOMIALS
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
Bayesian models for response surfaces, 2: Estimating the response surface [AD-A142788] N84-32001
Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines [AD-A142943] N84-32003

POLYURETHANE RESINS
Creep of stx glues [CETIM-1.3N.16.2] N84-31398

POPULATION THEORY
A fast method for computer image enhancement [INPE-3170-PRE/540] N84-31965

POPULATIONS
Activities in applied systems analysis N84-32026

POROSITY
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials [DE84-012667] N84-31309
Microfacies, depositional environments and diagenesis of the Amaps carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827

POROUS MATERIALS
New approach to the effective stress principle [DE84-006983] N84-31574

POROUS PLATES
Porous catalytic metal plate degeneration bed in a gas generator [AD-D011078] N84-31407

PORTABLE EQUIPMENT
The acoustic design of outside broadcast vehicles [BBC-RD-1984/3] N84-31454

POSITION (LOCATION)
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel [NASA-TM-58262] N84-31935
Bi- and poly-optimal confidence limits for a location and parameter [AD-A142960] N84-32012

POSITION ERRORS
Feed error effects on lens performance [AD-P003513] N84-31481

POSITIVE IONS
Fracto-emission from graphite/epoxy composites [NASA-CR-173845] N84-31291

POSITRONS
Engineering basis for selection of positron source material [DE84-011772] N84-32143

Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32336

POTASSIUM HYDROXIDES
Active material redistribution rates in zinc electrodes: Effect of alkaline electrolyte compositions having reduced zinc oxide solubility
[DE84-010709] N84-31525

POTENTIAL FLOW
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018

POTENTIAL THEORY
Hyperharmonic: cones and hyperharmonic morphisms
[ISBN-951-41-0476-5] N84-32027

POWDER METALLURGY
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352
Investigation of shock activated sintering and shock wave consolidation of selected powder materials
[DE84-013074] N84-31391

POWER AMPLIFIERS
Equipment for monitoring and control of television transmitters N84-31435

POWER CONVERTERS
Steady state performance of single-phase reaction motor N84-32035

POWER GAIN
Flowing effects in gas lasers
[AD-A141409] N84-31820

POWER LINES
Coupling of electromagnetic pulses created by a nuclear explosion on the ground with overhead power cables
[SNIAS-841-422-107] N84-31505
Calculation of currents induced in a network of overhead power lines by an electromagnetic impulse
[SNIAS-841-422-109] N84-31507

POWER SERIES
Large-signal amplifier based on ferrimagnetic echo N84-31440
An infinite series of symmetric designs
[MC-ZW-302/83] N84-32031

POWERED LIFT AIRCRAFT
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215

PRECIPITATION (CHEMISTRY)
Urban and local source effects on precipitation chemistry
[DE84-011848] N84-31803
Agglomeration and precipitation by sonic-inertial means: Abstract of the state of the art
[REPT-0563/84] N84-32126
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214

PRECIPITATION (METEOROLOGY)
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848

PRECISION
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446

PREDICTION ANALYSIS TECHNIQUES
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31827
Sources of error in objective analysis
[AD-A142772] N84-32020
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
Applied chromodynamics
[DE84-009136] N84-32152
A theoretical study of the energetics and dynamics of high energy inelastic collision processes
[AD-A142799] N84-32163
Predictions of entropies of molecules and liquids
[DE84-010504] N84-32216

PREDICTIONS
Transfer during sliding wear of selected metal systems N84-31341
Magnetically confined kinetic-energy storage ring: A new fundamental energy-storage concept
[DE84-011531] N84-31793
Three-dimensional computer model for the atmospheric general circulation experiment
[NASA-CR-171109] N84-31863

PREJUDICES
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276

PREMIXED FLAMES
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302

PREPROCESSING
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737

PRESIDENTIAL REPORTS
Publications of the Executive Office of the President, January 20, 1981 - March 31, 1984
[PB84-182328] N84-32296

PRESSES
Automation of a stamping press using sequential hydraulic manipulators
[CETIM-1-4N-090] N84-31422
Automation of a drop forge at the Centre Techniques des Industries Mecaniques (CETIM) forge section
[CETIM-1.3K.27.3] N84-31423

PRESSURE
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2
[BLL-M-35595-(5826.4)] N84-31337

PRESSURE DEPENDENCE
Pressure effects on wall heat transfer during flame quenching
[DE84-012265] N84-31575

PRESSURE DISTRIBUTION
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261

PRESSURE MEASUREMENT
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31586
Research study of pressure instrumentation
[NASA-CR-171143] N84-31599
Lubrication of machine elements
[NASA-RP-1125] N84-31840

PRESSURE OSCILLATIONS
Similarity criteria for spectra of pressure fluctuations in turbulent boundary layer at wall N84-32059

PRESSURE PULSES
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047

PRESSURE SENSORS
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-173660] N84-31596
Research study of pressure instrumentation
[NASA-CR-171143] N84-31599

PRESSURE VESSELS
Sideline vertification for multilayer pressure vessel and piping analysis including tangential analysis
[DE84-004333] N84-31711

PRINTED CIRCUITS
MIL-STD-1553B in MRASM (Medium Range Air to Surface Missile): The designer's challenge
[AD-P003541] N84-31145
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476

PROBABILITY DENSITY FUNCTIONS
Applications of the Mallavin calculus, part 2
[REPT-83-PT-2] N84-32032

PROBABILITY DISTRIBUTION FUNCTIONS
A method for the combination of stochastic time varying load effects N84-31669

PROBABILITY THEORY
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2
[BLL-M-35595-(5826.4)] N84-31337
How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704
A fast method for computer image enhancement
[INPE-3170-PRE/540] N84-31985
Statistical inference for reliability from stress strength relationships: The normal case
[AD-A142893] N84-32005
On point processes — probability theory
[MATH-CENTRE-TRACTS-165] N84-32025
Applications of the Mallavin calculus, part 2
[REPT-83-PT-2] N84-32032

PROBLEM SOLVING
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31098
Distributed problem solving for air fleet control: Framework and implementations
[AD-A143168] N84-31106
Solution of some additional electromagnetic problems by the discrete convolution method
[AD-A143056] N84-31493
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551
Global solutions for the one-dimensional equations of a viscous reactive gas
[AD-A142931] N84-31569
Applying artificial intelligence to large networks N84-31743
Continuation of research in computer simulation of integrated circuits
[AD-A143005] N84-31970
Abstraction, specification and implementation techniques with an application to garbage collection — data processing
[MATH-CENTRE-TRACTS-166] N84-31980
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997
Globally convergent procedures for solving nonlinear minimization problems
[AD-A142905] N84-32009
Stable method for solving linear programming problem with approximate data N84-32077
Two-phase methods of solving canonical problem of linear programming N84-32078
Numerical calculations in quantum field theories
[DE84-010692] N84-32217

PROCEDURES
A code of practice to constrain Ada (Trademark)
[AD-P003559] N84-31163

PROCESS CONTROL (INDUSTRY)
Advance in materials technology: Monitor issue number 1
[PB84-196266] N84-31377
Intelligent instruments for process measurement techniques (monitoring of sensors)
[BMFT-FB-T-84-078] N84-31611

PROCUREMENT MANAGEMENT
Managing aircraft/simulator concurrency
[AD-P003483] N84-32240

PROCUREMENT POLICY
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230
Effectiveness of multi-year and advance procurement contracts
[AD-P003462] N84-32239

PRODUCT DEVELOPMENT
Development of a digital air data computer using modern microprocessors, hybrid circuits, and pressure sensors with frequency output
[BMFT-FB-W-84-018] N84-31208
Development of a device for evaluation of interferograms
[BMFT-FB-T-84-097] N84-31613
Silicon solar cells: Development and qualification of thin (50 to 100 micron) and large area (5 cm x 5 cm) high efficiency cells
[BMFT-FB-W-84-016] N84-31798
Managing a low quantity, high technology trainer development program
[AD-P003484] N84-32241
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340

PRODUCTION ENGINEERING
Computer-Aided Engineering (CAE) in plastics technology
[CSIR-TRANS-1725] N84-31380

Optimizing tools for generating spherical surfaces and polishing powders in optical production technology [BMFT-FB-T-84-094] N84-32178
Profit responsibilities in the simulation and training equipment industry [AD-P003497] N84-32263
PRODUCTION MANAGEMENT
Managing a low quantity, high technology trainer development program [AD-P003464] N84-32241
PRODUCTIVITY
Realization of human work capacity: Interdisciplinary problems N84-31920
Stress in work N84-31921
Practical writing and editing techniques [DE84-012642] N84-32294
PROGRAM VERIFICATION (COMPUTERS)
J73AVS: A JOVIAL J73 automated verification system [AD-P003521] N84-31125
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software [AD-P003524] N84-31128
Software progress tracking system [AD-P003488] N84-32255
Automated software testing [AD-P003498] N84-32264
PROGRAMMERS
Ada (Trademark) training considerations [AD-P003560] N84-31164
PROGRAMMING LANGUAGES
The implementation and use of Ada on distributed systems with high reliability requirements [NASA-CR-173841] N84-31954
Implementation of INTERLISP on the VAX [AD-A141707] N84-31967
User friendly authoring languages: An alternative approach [AD-P003461] N84-32238
PROGRAMS
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1 [NASA-CR-170619] N84-31960
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983 [PB84-194802] N84-32271
PROJECT MANAGEMENT
National Airspace Review: Implementation plan N84-31107
Cost/schedule management for software development [AD-P003591] N84-31196
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process [AD-A142849] N84-31247
DMA (Defense Mapping Agency): The digital revolution [AD-A142787] N84-31767
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31864
Managing a low quantity, high technology trainer development program [AD-P003464] N84-32241
The Electric Vehicle Project [DE84-011788] N84-32309
PROJECT PLANNING
Space Station Systems Analysis Study. Volume 2: Program options, book 1, parts 1 and 2 [NASA-CR-161927] N84-31265
Rationale for US DOE energy storage program in hydrogen technology [DE84-010225] N84-31411
PROJECTORS
A wide field-of-view CRT projection system with optical feedback for self alignment [AD-P003447] N84-32224
PROP-FAN TECHNOLOGY
Analytical model of the structureborne interior noise induced by a propeller wake [NASA-CR-172381] N84-32119
PROPELLANT COMBUSTION
Combustion of redox mixes in the Through Bulkhead Initiator (TBI) configuration [SNIAS-841-422-115] N84-31332
PROPELLANT GRAINS
Thixotropic flame inhibitors for rocket propellant grains [AD-D011081] N84-31408
PROPELLANTS
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
PROPELLER BLADES
Nonlinear displacement analysis of advanced propeller structures using NASTRAN [NASA-TM-83737] N84-31683
Annoyance caused by propeller airplane flyover noise [NASA-TP-2356] N84-32124
PROPELLER SLIPSTREAMS
Analytical model of the structureborne interior noise induced by a propeller wake [NASA-CR-172381] N84-32119
PROPRIOCEPTION
Study of spatial asymmetry in human external electrical field N84-31932
Psychophysics of proprioceptive sensibility N84-31933
PROPULSION SYSTEM CONFIGURATIONS
AC propulsion system for an electric vehicle, phase 2 [NASA-CR-168244] N84-31514
PROTECTION
Missile system for low altitude air defence N84-31255
PROTECTIVE CLOTHING
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association [AD-A143157] N84-31406
PROTECTIVE COATINGS
Deposits on light alloys — aluminum [CETIM-12-F-380] N84-31371
PROTON BEAMS
PIXE and PBFA 2: Pulsed X-ray source feasibility study [DE84-011535] N84-32155
PROTON IRRADIATION
Study of proton and neutron activation of metal samples in low Earth orbit [NASA-CR-171113] N84-31763
PROTOSTARS
Studies of low-mass star formation with the large deployable reflector [NASA-TM-85960] N84-32328
PROVING
MIL-STD-1553B validation testing [AD-P003544] N84-31148
MIL-STD-1750A verification testing [AD-P003555] N84-31159
Digital avionics design for validation [AD-P003571] N84-31176
PROXIMITY EFFECT (ELECTRICITY)
Magnetic impurity scattering in in situ superconductors [DE84-012835] N84-32212
PSYCHOACOUSTICS
Annoyance caused by propeller airplane flyover noise [NASA-TP-2356] N84-32124
PSYCHOLOGICAL EFFECTS
Stability of physiological and psychological human functions under extreme environmental conditions N84-31910
Realization of human work capacity: Interdisciplinary problems N84-31920
PSYCHOLOGICAL FACTORS
The effect of information display format on multiple-cue judgment [AD-A142884] N84-31941
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276
PSYCHOLOGICAL TESTS
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931
PSYCHOLOGY
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation [JPRS-UNE-84-001] N84-31903
PSYCHOMOTOR PERFORMANCE
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-84-012] N84-31916
PSYCHOPHYSICS
Study of spatial asymmetry in human external electrical field N84-31932
PSYCHOPHYSIOLOGY
Psychophysiological aspects of monotonous human activity N84-31911
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
PUBLIC HEALTH
Noise as a public health problem, volume 1 [AD-A142412] N84-31799
Noise as a public health problem, volume 2 [AD-A142413] N84-31800
PULMONARY CIRCULATION
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel [NASA-TM-58262] N84-31935
PULSARS
Theoretical studies of the pulsar magnetosphere N84-31809
Theoretical study of cepheid light curves [DE84-012453] N84-32322
PULSE AMPLITUDE
Phase and amplitude control system for Stanford Linear Accelerator [DE84-011773] N84-32156
PULSE CODE MODULATION
Results of investigation of adaptive speech codes N84-31428
PULSE COMMUNICATION
Performance of digital communications over selective fading channels N84-31456
Analysis of modern analog and digital communication channels from a manager's perspective [AD-A143161] N84-31494
PULSE DURATION
IRIS pulsing ruby light source N84-32066
Propagation of nonlinear compression pulses through granular media N84-32106
PULSE GENERATORS
High power RF klystrons for linear accelerators [DE84-012074] N84-31527
PIXE and PBFA 2: Pulsed X-ray source feasibility study [DE84-011535] N84-32155
PULSE MODULATION
Cold-cathode gas-discharge modulator power tube N84-31443
PULSED LASERS
Simulations of erosion/corrosion surface chemical reactions with a laser beam [AD-A143001] N84-31354
Nd-3+ Beta prime prime alumina platelet laser [AD-A142797] N84-31621
Medical applications of lasers N84-31904
PULSED RADIATION
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode [DE84-008034] N84-32208
PUMPS
The Shock and Vibration Digest, volume 16, no. 7 [AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31660
PURIFICATION
Temperature dependence of the Raman OH-stretching overtone from liquid water [AD-A143131] N84-31305
PYROLYSIS
Laser-assisted solar cell metallization processing [NASA-CR-173875] N84-31619
PYROTECHNICS
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association [AD-A143157] N84-31406

Q

QUADRUPOLES
Operational parameters of a 2.0-MeV RFQ linac [DE84-011368] N84-31498
RFQ simulation code [DE84-011385] N84-31499
QUALITY CONTROL
Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests [DE84-012373] N84-31295
Lower confidence bounds on system reliability using component data: Maximum methodology [DE84-012613] N84-31658
Software progress tracking system [AD-P003488] N84-32255
Automated software testing [AD-P003498] N84-32264
QUANTUM CHROMODYNAMICS
Usual initial and final state effects in quantum chromodynamics [DE84-010422] N84-32148
Applied chromodynamics [DE84-009136] N84-32152
Theoretical high energy physics [DE84-011854] N84-32153
Numerical calculations in quantum field theories [DE84-010892] N84-32217
QUANTUM EFFICIENCY
Neutron damage effects in AlGaAs/GaAs solar cells [DE84-009448] N84-31791

QUANTUM ELECTRODYNAMICS
Electromagnetic effects in strong field of single crystals N84-32084
Chemical lasers N84-32093
QUANTUM ELECTRONICS
Solid state research [AD-A142901] N84-32204
QUANTUM MECHANICS
Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging [DE84-010712] N84-32137
Usual initial and final state effects in quantum chromodynamics [DE84-010422] N84-32148
QUANTUM THEORY
Numerical calculations in quantum field theories [DE84-010692] N84-32217
QUARTZ
Temperature derivatives of elastic stiffnesses and frequency-temperature behavior of quartz crystal plates N84-31675
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31616
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31628
Depositional environment and petrology of the Medicine Peak Quartzite (early proterozoic), southern Wyoming N84-31629
QUASARS
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326
QUENCHING
Wall quench and flammability limit effects on exhaust hydrocarbon emission [DE84-009754] N84-31307
Switching transients in a superconducting coil [DE84-012592] N84-31532
QUENCHING (COOLING)
Pressure effects on wall heat transfer during flame quenching [DE84-012265] N84-31575

R

RACETRACKS (PARTICLE ACCELERATORS)
Algorithm for secondary electron emission from water vapor by high velocity ions [DE84-011871] N84-32142
RADAR
Westinghouse uses USAF-developed standards [AD-P003572] N84-31177
Standard avionics software: The future strategy for cost-effective avionics [AD-P003582] N84-31187
The use of overlapped subarray techniques in simultaneous receive beam linear arrays [AD-P003501] N84-31469
RADAR ANTENNAS
The use of overlapped subarray techniques in simultaneous receive beam linear arrays [AD-P003501] N84-31469
Computer analysis of phased array far-field patterns for non-symmetrical feed networks [AD-P003502] N84-31470
RADAR CROSS SECTIONS
The AFL RCS (Radar Cross Section)/statistics code description, illustrations of output, and user's guide [AD-A142929] N84-31490
RADAR ECHOES
Model cloud relationships [AD-A142890] N84-31871
RADAR IMAGERY
Applications of the AVE-SESAME data sets to mesoscale studies [NASA-CR-3810] N84-31866
RADAR TRANSMISSION
Homing head imperfections altering missile guidance N84-31256
RADIAL DISTRIBUTION
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds [AD-A142840] N84-31100
Protective plasma envelope [DE84-013316] N84-32194
RADIAL VELOCITY
On the masses of white dwarfs in cataclysmic binaries N84-32323
RADIANCE
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper [E84-10160] N84-31751
Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper [E84-10161] N84-31752
Relative radiometric calibration of LANDSAT TM reflective bands [E84-10186] N84-31757
RADIANT FLUX DENSITY
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
RADIANT HEATING
Noncontradictory method of calculating radiation transfer, and problem of shock wave structure N84-32060
RADIATION
Cooling of semiinfinite body under conditions of nonlinear heat transfer at surface N84-32075
RADIATION ABSORPTION
Ray tracing study of electron cyclotron heating in the TBR 2 Tokamak [INPE-3192-PRE/556] N84-32181
RADIATION DAMAGE
Ionizing emissions and electronics [AD-A142065] N84-31466
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells [NASA-TM-83755] N84-31513
Radiation effects in optoelectronic devices [DE84-012869] N84-32176
RADIATION DETECTORS
The study of efficient low-power diffraction designs [NASA-CR-171142] N84-31566
RADIATION DISTRIBUTION
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
Conformal array analysis [AD-P003504] N84-31472
RADIATION EFFECTS
Laser induced polymerization reactions in solid propellant binders N84-31403
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Study of proton and neutron activation of metal samples in low Earth orbit [NASA-CR-171113] N84-31763
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature [AD-A142961] N84-31912
Effects of microwaves on cell membrane permeability [AD-A142979] N84-31913
Effects of radiofrequency radiation on differentiation of erythroleukemic cells [AD-A143036] N84-31914
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-84-017] N84-31924
Experimental study of strong nonlinear-optics effects in liquid crystals N84-32071
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope [DE84-013423] N84-32214
RADIATION HARDENING
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode [DE84-008034] N84-32208
RADIATION SOURCES
PIXE and PBFA 2: Pulsed X-ray source feasibility study [DE84-011535] N84-32155
RADIATION SPECTRA
Focusers of obliquely incident laser radiation N84-32099
RADIATION TOLERANCE
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells [NASA-TM-83755] N84-31513
RADIATION TRANSPORT
Noncontradictory method of calculating radiation transfer, and problem of shock wave structure N84-32060
RADIATIVE HEAT TRANSFER
Hypersonic three-dimensional flow of radiating gas around wing N84-32062
Heat transfer by radiation in hydrogen plasma N84-32106
RADIATIVE TRANSFER
Hypersonic three-dimensional flow of radiating gas around wing N84-32062
RADIATORS
Wideband microstrip ring radiator [AD-P003507] N84-31475
RADICALS
Laser Induced Chemistry. 1984 JPM Specialist Session [AD-A142922] N84-31400
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
RADII
Mie scattering as a technique for the sizing of air bubbles [AD-A142737] N84-32170
RADIO ASTRONOMY
Phase light range finder N84-31447
RADIO EQUIPMENT
Ionizing emissions and electronics [AD-A142065] N84-31466
RADIO FILTERS
Realization of high-frequency filters according to theory of guided spherical waves N84-31436
RADIO FREQUENCIES
RF design and performance of a multibeam, multiband antenna [AD-P003512] N84-31480
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature [AD-A142961] N84-31912
Effects of radiofrequency radiation on differentiation of erythroleukemic cells [AD-A143036] N84-31914
Design fabrication and testing of the BNL radio frequency quadrupole accelerator [DE84-011915] N84-32145
RADIO FREQUENCY INTERFERENCE
NETWORK: A user oriented, interactive, station-siting program for NOAA (National Oceanic and Atmospheric Administration) VHF weather radio [PB84-202233] N84-31978
RADIO NAVIGATION
Investigation, development and application of optimal output feedback theory. Volume 2: Development of an optimal, limited state feedback outer-loop digital flight control system for 3-D terminal area operation [NASA-CR-3629] N84-31218
RADIO RELAY SYSTEMS
Adaptive antennas for tropospheric radio relay lines N84-31432
RADIO SCATTERING
Nonlinear scattering of radio waves by metal objects N84-32049
RADIO SOURCES (ASTRONOMY)
Linear polarization and total flux density of silicon monoxide masers and active extragalactic objects at millimeter wavelengths N84-32314
RADIO TELESCOPES
Phase light range finder N84-31447
RADIO TRANSMISSION
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode [CRC-1375] N84-31458
RADIO WAVES
Nonlinear scattering of radio waves by metal objects N84-32049
RADIOACTIVE ISOTOPES
Power flattening techniques for radioisotopic thermoelectric generators [AD-A142937] N84-31520
RADIOACTIVE WASTES
Microprocessor enhanced real time manual control of an industrial robot [DE84-011606] N84-31645
Geology hydrology and mineral resources of crystalline rock areas of Northeastern US [DE84-013671] N84-31774
Data base management system of the National Low-Level Radioactive Waste Management Program [DE84-012769] N84-32291
RADIOACTIVITY
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California [DE84-009591] N84-32165
RADIOBIOLOGY
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature [AD-A142961] N84-31912
RADIOGRAPHY
Optical density radiation dose relationship — radiography [CETIM-100680] N84-32162

RADIOLYSIS
Use of pulse radiolysis to measure high temperature kinetics
[DE84-011702] N84-31324
RADIOMETERS
Discrimination of iron alteration minerals in remote sensing data N84-31727
RADIOMETRIC CORRECTION
Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper
[E84-10056] N84-31731
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10179] N84-31750
RADIOMETRIC RESOLUTION
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper
[E84-10180] N84-31751
Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper
[E84-10181] N84-31752
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10186] N84-31757
RAIL TRANSPORTATION
USSR report: Transportation
[JPRS-UTR-84-024] N84-31119
RAIN
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776
Interannual variations of rainfall in northeast Brazil and their connections with the large-scale features
[INPE-3207-PRE/565] N84-31868
RAIN FORESTS
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
Observations of radiation exchange above and below Amazonian forest
[INPE-3194-PRE/558] N84-31870
RAMAN SPECTRA
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B
[DE84-009328] N84-31329
Nonlinear theory of the free-electron laser
[INPE-3193-PRE/557] N84-31618
Thomson backscattering from an intense relativistic electron beam as a diagnostic for a free electron laser
[AD-A143027] N84-31623
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
[AD-A143142] N84-32172
A new model of Raman spectra in laser produced plasma
[DE84-009625] N84-32188
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
RAMAN SPECTROSCOPY
Temperature dependence of the Raman OH-stretching overtone from liquid water
[AD-A143131] N84-31305
RAMJET ENGINES
The annular flow electrothermal ramjet
[NASA-CR-174704] N84-31275
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Computational hierarchy for the analysis of combustion phenomena in ramjet environments N84-31277
RANDOM NUMBERS
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1
[AD-A143085] N84-32015
RANDOM SIGNALS
Investigation of statistical characteristics of random signals in nonlinear medium N84-32086
RANGE FINDERS
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656
RANGEFINDING
Terminal control for command to line of sight guided missile N84-31252
RANGELANDS
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776
RANKINE CYCLE
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306
RARE GASES
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy
[DE84-011638] N84-31320
RAY TRACING
A three-dimensional ray method and its application to the study of wave propagation in crustal structure with curved layers N84-31621
Ray tracing study of electron cyclotron heating in the TBR 2 Tokamak
[INPE-3192-PRE/556] N84-32181
RAYLEIGH SCATTERING
Density fluctuations in premixed turbulent flames
[DE84-012055] N84-31322
RAYLEIGH WAVES
Application of measurements of the propagation velocity of ultrasonic Rayleigh waves to surface inspection of materials
[CETIM-15-H-417] N84-31662
REACTION
Heart rhythm changes in response to sensorimotor load of varying complexity N84-31908
REACTION BONDING
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012667] N84-31309
Use of surface and thin film analysis techniques to study metal-organic and metal-polymer interaction
[DE84-012542] N84-31321
REACTION KINETICS
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Exponential-fitted methods for integrating stiff systems of ordinary differential equations: Applications to homogeneous gas-phase chemical kinetics N84-31279
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations N84-31280
Models for calculating reaction rates in turbulent, reacting flows N84-31281
Kinetics of complexation of the macrocycles 18C6 and 12C4 ethers with LiAsF-6 in 1,2-dimethoxyethane at 25 deg C
[AD-A143086] N84-31304
Stretch effects in plane premixed hydrogen-air fl. es
[DE84-012035] N84-313.1
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013086] N84-31328
Study of the kinetics of hydrogenation using aged catalysts
[DE84-006588] N84-31330
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Laser induced polymerization reactions in solid propellant binders N84-31403
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009987] N84-32215
REACTOR DESIGN
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680
Space reactor fuels performance and development issues
[DE84-011414] N84-32164
REACTOR SAFETY
Digital rotation measurement unit
[DE84-010872] N84-31528
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-006550] N84-31579
Reentry analysis
[DE84-012640] N84-32167
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185
REACTOR TECHNOLOGY
Slideline verification for multilayer pressure vessel and piping analysis including tangential analysis
[DE84-004333] N84-31711
START/TM: A study of start-up and fractional power operation of tandem mirror fusion reactors
[DE84-011477] N84-32196
REAL TIME OPERATION
Optimum control of electric motor drives for industrial robots
[DE84-012878] N84-31543
Instrumentation for real-time ultrasonic sensing of arc welding characteristics
[DE84-012536] N84-31649
Real-time ultrasonic sensing of arc welding processes
[DE84-005031] N84-31657
Data base generation: Improving the state-of-the-art
[AD-P003470] N84-32245
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
Microprocessors in aircrew training devices
[AD-P003485] N84-32252
Data base management of software development
[AD-P003486] N84-32253
RECEIVERS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-31427
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
RECEPTION DIVERSITY
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
RECOMBINATION REACTIONS
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
RECRYSTALLIZATION
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31358
RECURSIVE FUNCTIONS
Application of an adaptive noise technique on state estimation to data smoothing
[INPE-3187-PRE/552] N84-31983
REDUCED GRAVITY
Microgravity Science Applications Bibliography: 1984 revision
[NASA-TM-86651] N84-32283
REDUCTION (CHEMISTRY)
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334
REENTRY
Reentry analysis
[DE84-012640] N84-32167
REENTRY SHIELDING
Development of improved low-strain creep strength in Cabot alloy R-41 sheet — nickel base sheet alloy for reentry shielding
[NASA-CR-172392] N84-31348
REFLECTANCE
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper
[E84-10056] N84-31731
Model cloud relationships
[AD-A142690] N84-31871
REFLECTORS
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Simulation requirements for the Large Deployable Reflector (LDR)
[NASA-CR-171140] N84-32317
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85980] N84-32328

REFRACTIVITY
New approaches to photothermal spectroscopy
[DE84-008837] N84-31310
Experimental study of strong nonlinear-optics effects in liquid crystals N84-32071
REFRACTORY METAL ALLOYS
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519
REFRACTORY METALS
Microstructural studies of hydrogen and deuterium in BCC refractory metals
[DE84-011506] N84-31357
Sodium compatibility of refractory metal alloy/304L braze joints
[DE84-012877] N84-31364
Refractory alloy technology for space nuclear power applications
[DE84-001745] N84-32166
REFRIGERANTS
An investigation of single-substance horizontal two-phase flow
[DE84-012292] N84-31587
REGIONS
Investigation of role of subsurface zones in wear of materials
[DE84-012752] N84-31365
Geology of the Guslan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
REGRESSION ANALYSIS
Anthropometric and mass distribution characteristics of the adult female, revised
[AD-A143096] N84-31939
Bayesian models for response surfaces, 2: Estimating the response surface
[AD-A142768] N84-32001
Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines
[AD-A142843] N84-32003
REGULARITY
Applications of the Malliavin calculus, part 2
[REPT-83-PT-2] N84-32032
REGULATIONS
National Airspace Review: Implementation plan N84-31107
RELATIVISTIC EFFECTS
Electromagnetic dissociation of radioactive heavy-ion beams
[DE84-012266] N84-32146
Linear polarization and total flux density of silicon monoxide masers and active extragalactic objects at millimeter wavelengths N84-32314
RELATIVISTIC ELECTRON BEAMS
Thomson backscattering from an intense relativistic electron beam as a diagnostic for a free electron laser
[AD-A143027] N84-31623
Electromagnetic effects in strong field of single crystals N84-32084
Production of dense plasma column in strong magnetic fields and its diagnosis by laser methods N84-32104
Cerenkov radiation in the neighborhood of the emission threshold
[AD-A143088] N84-32135
RELATIVISTIC PARTICLES
Relativistic vector sub p x vector sub b acceleration of charged particles by an obliquely propagating electrostatic wave
[IFPJ-680] N84-32183
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation
[NASA-TM-86131] N84-32333
RELATIVISTIC PLASMAS
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32336
RELIABILITY
T700 engine case study report. IDA/OSD R and M (Institute for Defense Analyses/Office of the Secretary of Defense Reliability and Maintainability) study
[AD-A143104] N84-31211
Wind energy systems for electric utilities: A synthesis of value studies
[CE84-004520] N84-31796
The implementation and use of Ada on distributed systems with high reliability requirements
[NASA-CR-172841] N84-31954
The Electric Vehicle Project
[DE84-011788] N84-32309
RELIABILITY ANALYSIS
Reliability analysis of an ultra-reliable fault tolerant control system
[NASA-CR-166584] N84-31219
Probability of undetected error after decoding for a concatenated coding scheme
[NASA-CR-173837] N84-31992
RELIABILITY ENGINEERING
Intelligent instruments for process measurement techniques (monitoring of sensors)
[BMFT-FB-T-84-078] N84-31611
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955
The Electric Vehicle Project
[DE84-011788] N84-32309
REMOTE CONSOLES
MIL-STD-1553B Marconi LSI chip set in a remote terminal application
[AD-P003536] N84-31142
MIL-STD-1553 interface application notes
[AD-P003539] N84-31143
Third generation MIL-STD-1553B LSI chip set
[AD-P003542] N84-31146
Auxiliary programs for the Metal-Enclosed Microstrips Project
[INPE-3172-PRE/542] N84-31964
REMOTE CONTROL
Microprocessor enhanced real time manual control of an industrial robot
[DE84-011805] N84-31645
Advanced remotely maintainable force-reflecting servomanipulator concept
[DE84-011634] N84-31646
Basic research on intelligent robotic systems operating in hostile environments: New developments at ORNL
[DE84-011464] N84-31647
REMOTE HANDLING
Advanced remotely maintainable force-reflecting servomanipulator concept
[DE84-011634] N84-31646
REMOTE SENSING
Attitude determination using strapdown inertial sensors and adaptive estimation
[INPE-3180-PRE/545] N84-31106
Space research in Pakistan: A relentless pursuit N84-31227
Azerbaijan Institute develops subsatellite measurement systems N84-31238
Practical applications of a space station
[NASA-CR-173672] N84-31270
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725
Discrimination of iron alteration minerals in remote sensing data N84-31727
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
Global resources information system N84-31747
The potential of AI technique for remote sensing N84-31748
Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31762
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts
[PB84-190487] N84-31900
REMOTELY PILOTED VEHICLES
Distributed problem solving for air fleet control: Framework and implementations
[AD-A143166] N84-31106
RENAL FUNCTION
Pharmacologic counter measures minimizing post-space flight orthostatic intolerance — bed rest, drug disposition, and physiological function
[NASA-CR-173661] N84-31936
REQUIREMENTS
Digital avionics design for validation
[AD-P003571] N84-31176
RESEARCH
Polar research board report, 1983 and future plans
[PB84-194315] N84-31779
Research in nonlinear motion
[AD-A143000] N84-32013
Solid state research
[AD-A142991] N84-32204
RESEARCH AND DEVELOPMENT
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
DMA (Defense Mapping Agency): The digital revolution
[AD-A142787] N84-31787
The influence of Computer Aided Design (CAD) on research — aircraft design
[NLR-MP-83026-U] N84-31984
Guide to programs, fiscal year 1984: Guide describing National Science Foundation programs and activities
[PB84-193226] N84-32270
Technology, innovation and regional economic development. Background paper 2: Encouraging high-technology development
[PB84-180181] N84-32310
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340
RESEARCH MANAGEMENT
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
Space research in Pakistan: A relentless pursuit N84-31227
Technology transfer revisited
[DE84-012233] N84-32293
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340
RESEARCH VEHICLES
Status of the development of a long-life engine coolant system
[AD-A143098] N84-31642
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean
[AD-A142873] N84-31850
RESERVES
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
RESERVOIRS
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31801
RESIDUAL STRESS
The effects of internal stress and phase transformations on fracture N84-31671
The hole drilling method for residual stress distribution measurement
[CETIM-100730] N84-31720
RESISTOJET ENGINES
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet
[NASA-TM-83757] N84-31283
RESISTORS
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
RESONANCE
Conceptual basis of resonance ionization spectroscopy
[DE84-011662] N84-31318
Resonance ionization spectropecopy measurement of the vapor pressure of several molecular species
[DE84-010656] N84-31624
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
Resonances in electron-molecule scattering and photoionization
[DE84-012680] N84-32139
RESONANT FREQUENCIES
Lumped-circuit model of four vane RFQ resonator
[DE84-011343] N84-31497
Temperature derivatives of elastic stiffnesses and frequency-temperature behavior of quartz crystal plates N84-31675
RESONATORS
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
Lumped-circuit model of four vane RFQ resonator
[DE84-011343] N84-31497
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142986] N84-31622
RESOURCE ALLOCATION
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT
[AD-A142788] N84-32267
RESOURCES MANAGEMENT
Resource contention, synchronization, and information structure in distributed systems
[AD-A143037] N84-32287
RESPIRATORY PHYSIOLOGY
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
RESPONSES
Bayesian models for response surfaces, 2: Estimating the response surface .
[AD-A142768] N84-32001

Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines
[AD-A142643] N84-32003
RETAINING
Retractable tie-down device
[AD-D011079] N84-31643
RETRACTABLE EQUIPMENT
Retractable tie-down device
[AD-D011079] N84-31643
REUSABLE HEAT SHIELDING
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86280] N84-31560
REYNOLDS NUMBER
A review of some Reynolds number effects related to bodies at high angles of attack
[NASA-CR-3809] N84-31097
RHENIUM
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet
[NASA-TM-83757] N84-31283
RHODE ISLAND
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783
RIGID STRUCTURES
New approach to the effective stress principle
[DE84-006963] N84-31574
Compound strip methods for the analysis of continuous elastic plates N84-31670
RING CURRENTS
MAGSAT correlations with geoid anomalies — western Gulf of Mexico
[E84-10174] N84-31736
RINGS
Wideband microstrip ring radiator
[AD-P003507] N84-31475
RIVER BASINS
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
RIVERS
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range
[DE84-012545] N84-31771
Response of alluvial rivers to active tectonics N84-31812
The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815
ROBOTICS
Basic research on intelligent robotic systems operating in hostile environments: New developments at ORNL
[DE84-011464] N84-31647
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656
Computer aided ultrasonic testing
[CETIM-15-H-404] N84-31661
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
ROBOTS
Optimum control of electric motor drives for industrial robots
[DE84-012878] N84-31543
Microprocessor enhanced real time manual control of an industrial robot
[DE84-011605] N84-31645
ROBUSTNESS (MATHEMATICS)
Bi- and poly-optimal confidence limits for a location and parameter
[AD-A142980] N84-32012
The use of double sampling in studying robustness
[AD-A142982] N84-32022
ROCKET ENGINES
Helium thruster propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
ROCKET LAUNCHING
The annular flow electrothermal ramjet
[NASA-CR-174704] N84-31275
ROCKET PROPELLANTS
Advantages of metallic fuels for rocket propulsion N84-31237
ROCKET-BORNE INSTRUMENTS
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3208-PRE/584] N84-31244
ROCKS
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
RODS
Longitudinal vibrations of rods of finite length with radial deformation
[AD-A142674] N84-31703
ROOM TEMPERATURE
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
[AD-A143142] N84-32172
ROOTS OF EQUATIONS
Upper bounds for the numbers of solutions of diophantine equations
[MATH-CENTRE-TRACTS-168] N84-32019
ROTARY WINGS
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142640] N84-31100
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
ROTATING CYLINDERS
Stability of stationary rotation of cylinder filled with stratified viscous incompressible fluid N84-32054
ROTATING SHAFTS
Critical speed of centrifugal pumps N84-31677
ROTATION
The effect of finite rotation on a problem in plastic deformation
[DE84-012827] N84-31710
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875
ROTOR BLADES (TURBOMACHINERY)
Blade endwall flows in an axial flow compressor stage N84-31209
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
Positive displacement compounding of a heavy duty diesel engine
[NASA-CR-168266] N84-31641
ROTOR SYSTEMS RESEARCH AIRCRAFT
Results of the first complete static calibration of the RSRA rotor-load-measurement system
[NASA-TP-2327] N84-31111
ROTORS
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31660
ROUTES
A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
RUBY
New sapphire and ruby components and their manufacture using diamond abrasives
[CSIR-TRANS-1734] N84-31419
RUBY LASERS
IRIS pulsing ruby light source N84-32066
RUNGE-KUTTA METHOD
Two-dimensional vapor flow analysis in heat pipes
[DE84-012581] N84-31562
Flux-vector splitting and Runge-Kutta methods for the Euler equations
[NASA-CR-172415] N84-31993

S

SAFETY
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
SAFETY MANAGEMENT
Report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A143023] N84-31103
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273
Reentry analysis
[DE84-012640] N84-32167
SALYUT SPACE STATION
USSR report: Space
[JPRS-USP-84-004] N84-31228
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
Medical research in first 100 days of Salyut-7 flight N84-31230
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232
Azerbaijan InsCtute develops subsatellite measurement systems N84-31236
SAMPLES
How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704
SAMPLING
Statistical tests for detecting crustal movements using Bayesian inference
[PB84-196811] N84-31861
Strong confidence intervals: A compromise between the Gaussian and the slash
[AD-A142981] N84-32021
The use of double sampling in studying robustness
[AD-A142982] N84-32022
SAN JUAN MOUNTAINS (CO)
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
SAPPHIRE
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155
New sapphire and ruby components and their manufacture using diamond abrasives
[CSIR-TRANS-1734] N84-31419
SATELLITE ANTENNAS
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460
SATELLITE ATTITUDE CONTROL
An adaptive attitude controller for terrestrial artificial satellites
[INPE-3186-PRE/551] N84-31243
Pitch control of a satellite using stabilizing flaps
[INPE-3185-PRE/550] N84-31246
SATELLITE CONTROL
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
SATELLITE DESIGN
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
SATELLITE IMAGERY
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting
[E84-10176] N84-31738
TM digital image products for applications — computer compatible tapes
[E84-10178] N84-31749
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10179] N84-31750
TM digital image products for applications — computer compatible tapes
[E84-10183] N84-31754
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3619] N84-31956
SATELLITE OBSERVATION
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts
[PB84-190467] N84-31900
SATELLITE ORBITS
Angles-only, ground-based, initial orbit determination
[AD-A142994] N84-31241
SATELLITE PERTURBATION
Non-integrability of planar oscillation equation for satellite in elliptical orbit N84-32109

SATELLITE SURFACES
Phobos: Close encounter imaging from the Viking Orbiters
[NASA-RP-1108] N84-32330
SATELLITE TRACKING
Angles-only, ground-based, initial orbit determination
[AD-A142994] N84-31241
SATURN ATMOSPHERE
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
N84-32331
SAUDI ARABIA
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[EB4-10169] N84-31760
SCALARS
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997
SCALE MODELS
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273
SCANNERS
Proceedings of the Antenna Applications Symp., volume 2
[AD-A142754] N84-31467
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
SCANNING
Differential scanning calorimeter data acquisition system
[AD-A143118] N84-31600
SCATTERING
Optical coating materials for the ultraviolet: Selection and characterization
[DE84-011504] N84-31629
Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging
[DE84-010712] N84-32137
Improved materials for DC dynamic scattering at elevated temperatures
[AD-A143076] N84-32207
Energy redistribution in diatomic molecules on surfaces
[DE84-011442] N84-32213
Optical and infrared polarization as a probe of matter near stars N84-32324
SCHEDULES
Cost/schedule management for software development
[AD-P003591] N84-31196
Cost and schedule control systems criteria for contract performance measurement, information pamphlet
[DE84-012576] N84-32269
Calendar of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341
SCHEDULING
The Program Planning Review (PPR): Milestone or millstone?
[AD-P003493] N84-32256
SCIENCE
Directory of computerized data files, 1984
[PB84-160126] N84-32303
SCIENTISTS
Summer faculty fellowship program, 1984
[NASA-CR-172409] N84-32221
SCINTILLATION
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
N84-32331
SEA LEVEL
Effect of external pressure environment on the internal noise level due to a source inside a cylindrical tank
[NASA-TM-85814] N84-31226
SEA OF JAPAN
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901
SEALS (STOPPERS)
Computational fluid mechanics utilizing the variational principle of modeling damping seals
[NASA-CR-171114] N84-31553
SEARCHING
The user's mental model of an information retrieval system: Effects on performance N84-32275
SEATS
Simulated crash decelerations in a light aircraft cabin
[AD-A142906] N84-31102
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1980 - 1990
[AD-A142946] N84-31948
SECONDARY EMISSION
Algorithm for secondary electron emission from water vapor by high velocity ions
[DE84-011871] N84-32142
SEDIMENT TRANSPORT
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31801
SEDIMENTARY ROCKS
Geology, petrology and tectonic significance of the Mesozoic Paleooceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
SEDIMENTS
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730
Convergence tectonics of the Peru Trench: 8 deg S - 15 deg S latitude N84-31824
Depositional environment and petrology of the Medicine Peak Quartzite (early proterozoic), southern Wyoming
N84-31829
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming
N84-31830
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831
SEISMIC WAVES
Direct generation of seismic floor response spectra for classically and nonclassically damped structures
[PB84-191675] N84-31860
SEISMOGRAPHS
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean
[AD-A142873] N84-31850
Seismological studies of the continental lithosphere
[PB84-194752] N84-31862
SEISMOLOGY
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 — Michigan, Wisconsin, and Minnesota
[DE84-012682] N84-31775
Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901
SELENIDES
Far infrared optical properties of WbSe3
[DE84-009223] N84-32173
SELF ALIGNMENT
A wide field-of-view CRT projection system with optical feedback for self alignment
[AD-P003447] N84-32224
SEMICONDUCTOR DEVICES
Modelling of transfer processes in monopolar semiconductor structures with submicron dimensions
N84-31453
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Nonequilibrium optical and acoustic phonons in semiconductors N84-32085
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195
SEMICONDUCTOR DIODES
Microwave phase modulators using semiconductor diodes (survey) N84-31448
A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010978] N84-31797
Radiation effects in optoelectronic devices
[DE84-012689] N84-32176
SEMICONDUCTOR JUNCTIONS
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529
SEMICONDUCTOR LASERS
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
Source of optical pumping for high-resolution spectroscopy with semiconductor laser N84-32070
Picosecond parametric optical oscillator with amplification of radiation from tunable semiconductor laser N84-32097
Radiation effects in optoelectronic devices
[DE84-012689] N84-32176
SEMICONDUCTORS (MATERIALS)
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics
N84-32052
Superlattice structures grown by molecular beam epitaxy
[DE84-011288] N84-32209
SENSITIVITY
Calibration of CT-4A fatigue test article, March 1983
[AD-A142860] N84-31115
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT
[AD-A142788] N84-32267
SENSORIMOTOR PERFORMANCE
Heart rhythm changes in response to sensorimotor load of varying complexity N84-31908
Psychophysiological aspects of monotonous human activity N84-31911
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A142919] N84-31947
SEPARATED FLOW
Feedback in separated flows over symmetric airfoils
[NASA-TM-83758] N84-31091
A direct numerical method for the solution of unsteady Navier-Stokes equations in generalized orthogonal coordinates N84-31549
Jet spoiler arrangement for wind turbine
[DE84-011303] N84-31787
SERIES (MATHEMATICS)
Efficient sequential designs with binary data
[AD-A142904] N84-32008
Some observations concerning the zero-curves of the real and imaginary parts of Riemann's zeta function
[MC-ZW-201/83] N84-32030
SERVICE LIFE
Heat pipe development status
[DE84-012580] N84-31583
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790
Weibull analysis handbook
[AD-A143100] N84-32023
SERVICE MODULES
Spacecraft servicing demonstration plan
[NASA-CR-171132] N84-31256
SERVOMECHANISMS
Advanced remotely maintainable force-reflecting servomanipulator concept
[DE84-011634] N84-31648
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656
SET THEORY
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31998
On point processes — probability theory
[MATH-CENTRE-TRACTS-165] N84-32025
SEX FACTOR
First mixed crew in space N84-31917
SHAFTS (MACHINE ELEMENTS)
Shaft coupling device
[AD-D011060] N84-31644
SHAKERS
Modal parameter estimation via shaker versus speaker excitation
[DE84-012697] N84-31223
SHALE OIL
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado
N84-31825
SHEAR FLOW
Theoretical and experimental investigations of asymmetric turbulent supersonic free shear layers
N84-31086
SHEAR LAYERS
Theoretical and experimental investigations of asymmetric turbulent supersonic free shear layers
N84-31086
Acoustic excitation: A promising new means of controlling shear layers
[NASA-TM-83772] N84-31096
Flow structures and their evolution in turbulent shear layer N84-32091
SHEAR PROPERTIES
Graduate engineering research participation in aeronautics
[NASA-CR-173849] N84-32220
SHEAR STRESS
Cyclic torsion testing
[NASA-TM-83756] N84-31687
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Considerations on deformable ability and ultimate strength of seismic walls. Part 2: About the derivation of a formula on ultimate shearing stress of walls and its applied verification for some experimental results
N84-32042

SHELL STABILITY
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667

SHELL THEORY
New variational formulations of hybrid stress elements N84-31690

SHELLS (STRUCTURAL FORMS)
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667
Nonlinear Structural Analysis [NASA-CP-2297] N84-31688
New variational formulations of hybrid stress elements N84-31690
Nonlinear finite element analysis of shells with large aspect ratio N84-31692

SHIELDING
Protective plasma envelope [DE84-013316] N84-32194

SHIPS
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode [CRC-1375] N84-31458
Marine Seismic System (MSS) deployment. Phase 5: An investigation of techniques and deployment scenarios for installation of triaxial seismometer in a borehole in the deep ocean [AD-A142873] N84-31850

SHOCK TESTS
Nonstationary oblique-shock-wave reflections in air [UTIAS-270] N84-31562

SHOCK TUBES
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section [UTIAS-TN-255] N84-31563

SHOCK TUNNELS
Gasdynamic study of model with combustion in shock tunnel N84-32061

SHOCK WAVE INTERACTION
Nonstationary oblique-shock-wave reflections in air [UTIAS-270] N84-31562

SHOCK WAVES
Investigation of shock activated sintering and shock wave consolidation of selected powder materials [DE84-013074] N84-31391
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
Response of a plaster-wood room subjected to simulated sonic booms [UTIAS-276] N84-31701
Noncontradictory method of calculating radiation transfer, and problem of shock wave structure N84-32060
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32068
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
Studies of low-mass star formation with the large deployable reflector [NASA-TM-85960] N84-32326

SHORT TAKEOFF AIRCRAFT
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft [NASA-TM-85871] N84-31215

SHORT WAVE RADIATION
Design of short-wave absorption lines N84-31433

SIDELOBES
A comparative study of linear array synthesis technique using a personal computer [AD-P003500] N84-31488
Computer analysis of phased array far-field patterns for non-symmetrical feed networks [AD-P003502] N84-31470
Phase error effects on the radiation patterns of space-fed planar phased arrays [AD-P003505] N84-31473

SIGNAL ANALYSIS
Comparison of simulation and measurement techniques for continuous waves and pulses [SNIAS-841-422-103] N84-31501
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31664
Analysis of space telescope data collection systems [NASA-CR-171129] N84-31958
Signal analysis and data processing system (acoustic and vibratory) [CETIM-11-H-50-9] N84-31981

SIGNAL FADING
Performance of digital communications over selective fading channels N84-31456
Effect of spatial decorrelation on nulling performance of linear adaptive array [AD-A143013] N84-31570

SIGNAL GENERATORS
Method and apparatus for measuring response time — thermocouples [DE84-011042] N84-31603

SIGNAL PROCESSING
Architectural and control considerations for a high speed signal processor implemented with an Ada (Trademark) executive [AD-P003594] N84-31199
USSR report: Electronics and electrical engineering [JPRS-UEE-84-008] N84-31427
Results of investigation of adaptive speech codes N84-31428
Adaptive multibeam antenna array N84-31430
Large-signal amplifier based on ferrimagnetic echo N84-31440
Multiple source DF (Direction Finding) signal processing: An experimental system [AD-P003515] N84-31483
Determining the number of signals by information theoretic criteria [AD-A142748] N84-31486
Embedded information transfer technology assessment [AD-A142849] N84-31518
Using information on tangential target motion in space-time signal processing N84-32101

SIGNAL RECEPTION
Digital rotation measurement unit [DE84-010672] N84-31528
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting [E84-10176] N84-31738

SIGNAL REFLECTION
Large-signal amplifier based on ferrimagnetic echo N84-31440

SIGNAL TO NOISE RATIOS
Computer analysis of phased array far-field patterns for non-symmetrical feed networks [AD-P003502] N84-31470

SIGNAL TRANSMISSION
Digital transmission: 68Mbit/s pal field trial system [BBC-RD-1984/5] N84-31455

SILENCERS
Compressed air exhaust silencers, summary [CETIM-11-H-275] N84-31650

SILICATES
Argillic alteration associated with the Amethyst Vein System, Creede Mining District, Colorado N84-31832

SILICON
A new silicon-on-sapphire MIL-STD-1750A microprocessor [AD-P003551] N84-31155
IUE observations of variable type I Seyfert galaxies N84-31781

SILICON ALLOYS
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion [DE84-012366] N84-31363

SILICON CARBIDES
Property screening and evaluation of ceramic turbine materials [AD-A142739] N84-31210
Improvements in mechanical properties in SiC by the addition of TiC particles [DE84-012352] N84-31297
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials [DE84-012867] N84-31309

SILICON DIOXIDE
Opacification of high temperature fibrous insulation [NASA-CR-166578] N84-31285
Computer simulation of surface and film processes [NASA-CR-173682] N84-31662
A study of the drawing process for optical fibers [AD-A142930] N84-32171
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers [AD-A143142] N84-32172

SILICON FILMS
Silicon solar cells: Development and qualification of thin (50 to 100 micron) and large area (5 cm x 5 cm) high efficiency cells [BMFT-FB-W-84-016] N84-31798
Research Reports of the Faculty of Engineering, no. 31 [DEC/1983/31] N84-32034
Improvement in quality of silicon-based amorphous films N84-32041
Studies of hydrogenated amorphous silicon [DE84-011868] N84-32211

SILICON NITRIDES
Property screening and evaluation of ceramic turbine materials [AD-A142739] N84-31210
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials [DE84-012867] N84-31309
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics [DE84-011786] N84-31392

SILOXANES
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100

SILVER
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies [DE84-009967] N84-32215

SILVER BROMIDES
Research Reports of the Faculty of Engineering, no. 31 [DEC/1983/31] N84-32034
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038

SIMPLEX METHOD
Sequential method of minimizing nonlinear function on simplex N84-32060

SIMULATION
Industrial forging applications of shaping simulation using modeling clay [CETIM-1.3K.36.2] N84-31424
A technique for simulating conduction interference created by electromagnetic pulses (EMP) [SNIAS-841-422-104] N84-31502
Simulation of vibratory processes in damped structures with temperature-frequency characteristics of vibration absorbing materials taken into account N84-32048
On-line task analyses in maintenance simulation [AD-P003452] N84-32229
Special features of information presentation in teaching systems [BLL-M-35604-(5828.4)] N84-32273
Simulation requirements for the Large Deployable Reflector (LDR) [NASA-CR-171140] N84-32317

SIMULATORS
Data base management of software development [AD-P003486] N84-32253

SINGLE CRYSTALS
Preliminary experiments on phase conjugation for flow visualization — barium titanate single crystals [NASA-TM-83766] N84-32169

SINGULARITY (MATHEMATICS)
Calculating electric fields in semiconductor structures when singularities are present N84-32051

SINTERING
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials [DE84-012867] N84-31309
Analytical characterization of coatings and thin overlayers [DE84-011902] N84-31389
Investigation of shock activated sintering and shock wave consolidation of selected powder materials [DE84-013074] N84-31391

SIZE (DIMENSIONS)
How many specimens? An aid in the design of fatigue test programs [AD-A142810] N84-31704

SIZE DETERMINATION
Mie scattering as a technique for the sizing of air bubbles [AD-A142737] N84-32170

SIZE DISTRIBUTION
Development of a global model for atmospheric backscatter at CO2 wavelengths [NASA-CR-171117] N84-31835
Development of a global model for atmospheric backscatter at CO2 wavelengths [NASA-CR-171118] N84-31836
Development of a global model for atmospheric backscatter at CO2 wavelengths [NASA-CR-171127] N84-31837

SLEEP
Noise as a public health problem, volume 1 [AD-A142412] N84-31799

SLENDER BODIES
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory [NASA-TM-85934] N84-31090

SLIDING
Transfer during sliding wear of selected metal systems N84-31341

Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
SLIP FLOW
An investigation of single-substance horizontal two-phase flow
[DE84-012292] N84-31587
SLOT ANTENNAS
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
Broadband cavity-backed slot using printed circuit technology
[AD-P003506] N84-31476
SLOTS
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
SNAP 8
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-009591] N84-32165
SNOW COVER
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
SOCIOLOGY
Directory of computerized data files, 1984
[PB84-180126] N84-32303
SODIUM
Perspective of the corrosive behavior of lithium and sodium
[DE84-011635] N84-31362
Sodium compatibility of refractory metal alloy/304L braze joints
[DE84-012677] N84-31364
SODIUM SULFATES
Environmentally-controlled crack growth rate of type 304 stainless steel in high temperature sulfate solutions
N84-31342
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
SODIUM SULFUR BATTERIES
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539
SOFTWARE ENGINEERING
Software modifications to the Demonstration Advanced Avionics Systems (DAAS)
[NASA-TM-85942] N84-31105
Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P003588] N84-31193
A corporate approach to an embedded software development and support standard
[AD-P003589] N84-31194
MIL-STD defense system software development
[AD-P003590] N84-31195
Cost/schedule management for software development
[AD-P003591] N84-31196
Planning of operational software implementation tool
[AD-P003595] N84-31200
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510
A computerized system for establishing electric-vehicle battery requirements
[DE84-011728] N84-31545
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
DEC LSI-11/HP9885A software
[DE84-012412] N84-31952
Software design issues in the implementation of hierarchical display editors N84-31953
The implementation and use of Ada on distributed systems with high reliability requirements
[NASA-CR-173841] N84-31954
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955
Accounting utility for determining individual usage of production level software systems
[NASA-CR-172414] N84-31959
Guidelines for testing and release procedures
[NASA-CR-166581] N84-31962
Redlight certification software design specifications
[NASA-CR-171136] N84-31966
A software scheme for managing magnetic tape storage space
[AD-A142847] N84-31969
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
Guidelines for software production in developed countries
[PB84-202795] N84-31986
Software progress tracking system
[AD-P003468] N84-32255
User-friendly software: The role of the user
[AD-P003469] N84-32256
Automated software testing
[AD-P003496] N84-32264
Automatic audit information system for software development
[AD-P003499] N84-32265
SOFTWARE TOOLS
Management overview of the benefits of efficient JOVIAL J73/1750A software tools
[AD-P003519] N84-31123
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software
[AD-P003524] N84-31128
PAS/NEB: A PASCAL language tool for the MCF (Military Computer Family)
[AD-P003535] N84-31139
The KAPSE (Kernel Ada (Trademark) Programming Support Environment) interface team
[AD-P003557] N84-31161
A general purpose computer architecture investigation facility
[AD-P003573] N84-31178
Planning of operational software implementation tool
[AD-P003595] N84-31200
SOIL MECHANICS
New approach to the effective stress principle
[DE84-006963] N84-31574
SOILS
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-009591] N84-32165
SOLAR ARRAYS
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511
SOLAR CELLS
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
Laser-assisted solar cell metallization processing
[NASA-CR-173875] N84-31619
IUE observations of variable type I Seyfert galaxies
N84-31781
Neutron damage effects in AlGaAs/GaAs solar cells
[DE84-009448] N84-31791
Silicon solar cells: Development and qualification of thin (50 to 100 micron) and large area (5 cm x 5 cm) high efficiency cells
[BMFT-FB-W-84-016] N84-31798
SOLAR COLLECTORS
Batteries and accumulators for future Aerospatiale projects
[SNIAS-841-422-111] N84-31282
Two years experience testing solar collectors in Brazil
[INPE-3221-RPE/461] N84-31785
SOLAR ENERGY CONVERSION
USSR report: Space
[JPRS-USP-84-004] N84-31226
Pravda cites advantages of project for orbiting solar reflectors N84-31235
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009363] N84-32288
SOLAR FLARES
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336
SOLAR OBLATENESS
The shape of the Sun N84-32334
SOLAR RADIATION
Observations of radiation exchange above and below Amazonian forest
[INPE-3194-PRE/558] N84-31670
Geophysical monitoring for climatic change Number 11,
[PB84-181841] N84-31683
SOLAR REFLECTORS
Pravda cites advantages of project for orbiting solar reflectors N84-31235
SOLAR SYSTEM
Galactic cycles and their relationship to life on Earth
[DE84-011737] N84-32329
SOLAR TEMPERATURE
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335
SOLAR THERMAL ELECTRIC POWER PLANTS
Solar thermal parabolic dish systems: Technology and applications
[DE84-012239] N84-31792
SOLAR-PUMPED LASERS
A blackbody-pumped CO2-N2 transfer laser
[NASA-TP-2347] N84-31617
SOLID ELECTROLYTES
A combined thermodynamic study of nickel-base alloys
[DE84-013467] N84-31368
Technology base research project for electrochemical energy storage
[DE84-012248] N84-31535
SOLID PROPELLANT COMBUSTION
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011081] N84-31408
SOLID PROPELLANT ROCKET ENGINES
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639
SOLID PROPELLANTS
Development, test and delivery of solid propellant generators for inflation of PFD's
[AD-A1300477] N84-31946
SOLID ROCKET BINDERS
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Laser induced polymerization reactions in solid propellant binders N84-31403
SOLID STATE
Nuclear Magnetic Resonance (NMR) study of glass fiber-epoxy resin composites in the solid state
N84-31299
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
Solid state research
[AD-A142991] N84-32204
SOLID STATE DEVICES
Solid state research
[AD-A142991] N84-32204
SOLID SURFACES
Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces
[AD-A143041] N84-31355
SOLID WASTES
Producer gas: Another fuel for motor transport
[DE84-901066] N84-31416
SOLIDIFICATION
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure
[DE84-012395] N84-31361
SOLIDS
Analysis of moisture in solids: A review of the last decade or from Pande to the present
[DE84-011166] N84-31326
DYNA3D user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1
[DE84-012628] N84-31979
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field
N84-32045
Physics of ion sputtering
[DE84-011664] N84-32150
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160
SOLUTES
Hydrogeology, digital solute-transport simulation, and geochemistry of the Lower Cretaceous aquifer system near Baltimore, Maryland N84-31728
SOLVENT EXTRACTION
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013086] N84-31328

SOLVENTS
Determination of evaporation rates of organic solvents by thin-film evaporometer
[DE84-012308] N84-31313
Study of the kinetics of hydrogenation using aged catalysis
[DE84-006568] N84-31330
SONIC BOOMS
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701
SOUND AMPLIFICATION
Equipment for monitoring and control of television transmitters N84-31435
SOUND FIELDS
Sound field of turbulent wake N84-32048
SOUND INTENSITY
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173648] N84-32115
SOUND PROPAGATION
Formation of coherent structures by acoustical effects in a turbulent wake N84-32055
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173640] N84-32117
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83760] N84-32122
SOUND TRANSMISSION
Digital transmission: 68Mbit/s pal field trial system
[BBC-RD-1984/5] N84-31455
Dependence of acoustic properties of sound absorbing fibrous materials on their structure N84-32044
Formation of coherent structures by acoustical effects in a turbulent wake N84-32055
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173648] N84-32115
SOUND WAVES
On waves in nonadiabatic and nonequilibrium gases
[AD-A141450] N84-31465
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701
Signal analysis and data processing system (acoustic and vibratory)
[CETIM-11-H-50-9] N84-31981
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056
Electromagnetic excitation of sound in metals N84-32082
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83760] N84-32122
SOUTHERN HEMISPHERE
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31846
SOVIET SPACECRAFT
Results from Astron satellite after one year in orbit N84-31233
List of recent Soviet space launches N84-31239
SPACE BASED RADAR
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
SPACE COMMUNICATION
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460
SPACE COOLING (BUILDINGS)
Laboratory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment
[PB84-182146] N84-31426
SPACE ENVIRONMENT SIMULATION
Testing of coatings in space, Long Duration Exposure Facility (LDEF)
[BMFT-FB-W-84-017] N84-31269
SPACE FLIGHT
Reflight certification software design specifications
[NASA-CR-171138] N84-31966
SPACE HEATING (BUILDINGS)
Laboratory evaluation of the steady-state and part load performance of absorption type heating and cooling equipment
[PB84-182146] N84-31426
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009363] N84-32268
SPACE LABORATORIES
Practical applications of a space station
[NASA-CR-173672] N84-31270
SPACE MISSIONS
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2
[NASA-CR-161590] N84-31263
Space Station Systems Analysis Study. Volume 2: Program review report
[NASA-CR-161231] N84-31264
SPACE POWER REACTORS
Space reactor fuels performance and development issues
[DE84-011414] N84-32164
Refractory alloy technology for space nuclear power applications
[DE84-001745] N84-32166
Reentry analysis
[DE84-012640] N84-32167
SPACE PROCESSING
Microgravity Science Applications Bibliography: 1984 revision
[NASA-TM-86651] N84-32263
SPACE PROGRAMS
Space research in Pakistan: A relentless pursuit N84-31227
SPACE SHUTTLE MAIN ENGINE
Computational fluid mechanics utilizing the variational principle of modeling damping seals
[NASA-CR-171114] N84-31553
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171122] N84-31594
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-173660] N84-31596
Research study of pressure instrumentation
[NASA-CR-171143] N84-31599
SPACE SHUTTLE ORBITERS
Aerothermodynamic data base, phase C
[NASA-CR-173662] N84-31259
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86280] N84-31560
SPACE SHUTTLE PAYLOADS
BRESEX: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface
[NASA-CR-173673] N84-31271
Space reactor fuels performance and development issues
[DE84-011414] N84-32164
SPACE SHUTTLES
Aerothermodynamic data base, phase C
[NASA-CR-173662] N84-31259
SPACE STATIONS
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2
[NASA-CR-161590] N84-31263
Space Station Systems Analysis Study. Volume 2: Program review report
[NASA-CR-161231] N84-31264
Space Station Systems Analysis Study. Volume 2: Program options, book 1, parts 1 and 2
[NASA-CR-161927] N84-31265
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511
SPACE TOOLS
On orbit surfacing of thermal control surfaces
[NASA-CR-171121] N84-31266
SPACE TRANSPORTATION SYSTEM
Space transportation systems of the future N84-31236
SPACE-TIME FUNCTIONS
Effect of spatial decorrelation on nulling performance of linear adaptive array
[AD-A143013] N84-31570
Using information on tangential target motion in space-time signal processing N84-32101
SPACEBORNE EXPERIMENTS
Testing of coatings in space, Long Duration Exposure Facility (LDEF)
[BMFT-FB-W-84-017] N84-31269
The annular flow electrothermal ramjet
[NASA-CR-174704] N84-31275
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31763
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31847
SPACEBORNE PHOTOGRAPHY
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Phobos: Close encounter imaging from the Viking Orbiters
[NASA-RP-1109] N84-32330
SPACEBORNE TELESCOPES
Results from Astron satellite after one year in orbit N84-31233
Simulation requirements for the Large Deployable Reflector (LDR)
[NASA-CR-171140] N84-32317
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
SPACECRAFT CHARGING
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268
SPACECRAFT COMMUNICATION
Space research in Pakistan: A relentless pursuit N84-31227
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477
SPACECRAFT CONFIGURATIONS
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2
[NASA-CR-161590] N84-31263
Space Station Systems Analysis Study. Volume 2: Program review report
[NASA-CR-161231] N84-31264
Space Station Systems Analysis Study. Volume 2: Program options, book 1, parts 1 and 2
[NASA-CR-161927] N84-31265
SPACECRAFT DESIGN
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561
SPACECRAFT LAUNCHING
List of recent Soviet space launches N84-31239
SPACECRAFT MAINTENANCE
Spacecraft servicing demonstration plan
[NASA-CR-171132] N84-31258
SPACECRAFT MOTION
Non-integrability of planar oscillation equation for satellite in elliptical orbit N84-32109
SPACECRAFT POWER SUPPLIES
Batteries and accumulators for future Aerospatiale projects
[SNIAS-841-422-111] N84-31262
SPACECRAFT RECOVERY
Optimization of the capture process for a rigid satellite stabilized by gravity gradient
[INPE-3184-PRE/549] N84-31245
SPACECRAFT SHIELDING
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261
SPACECRAFT STABILITY
Graduate engineering research participation in aeronautics
[NASA-CR-173849] N84-32220

SPACECRAFT STRUCTURES
Spacecraft servicing demonstration plan
[NASA-CR-171132] N84-31258
Graduate engineering research participation in aeronautics
[NASA-CR-173649] N84-32220
SPACELAB PAYLOADS
The study of efficient low-power diffraction designs
[NASA-CR-171142] N84-31596
SPALLATION
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31706
SPARK IGNITION
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B
[DE84-009328] N84-31329
Research and development of alcohol fuel usage in spark ignited engines
[DE84-011177] N84-31412
SPATIAL DISTRIBUTION
A method to combine remotely sensed and in situ measurements: Program documentation
[E84-10172] N84-31735
Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
SPATIAL RESOLUTION
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation — San Matteo Bridge and Stockton, California
[E84-10188] N84-31759
SPECIFICATIONS
MIL-STD-1750A verification testing
[AD-P003555] N84-31159
An integrated approach to a successful embedded computer resource project
[AD-P003574] N84-31179
MIL-PRIME Program System
[AD-P003576] N84-31181
Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests
[DE84-012373] N84-31295
Seismological studies of the continental lithosphere
[PB84-194752] N84-31662
SPECKLE PATTERNS
Theory of acoustic speckle N84-32114
SPECTRAL BANDS
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper
[E84-10160] N84-31751
Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper
[E84-10161] N84-31752
Spectral characterization of the LANDSAT Thematic Mapper sensors
[E84-10184] N84-31755
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10186] N84-31757
Investigation of LANDSAT D Thematic Mapper geometric performance: Line to line and band to band registration — Toulouse, France and Mississippi, U.S.A.
[E84-10187] N84-31758
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation — San Matteo Bridge and Stockton, California
[E84-10188] N84-31759
SPECTRAL METHODS
Diagnostics for an XUV/soft X-ray laser
[DE84-012593] N84-31628
Similarity criteria for spectra of pressure fluctuations in turbulent boundary layer at wall N84-32059
SPECTRAL RECONNAISSANCE
Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725
SPECTRAL SENSITIVITY
Spectral characterization of the LANDSAT Thematic Mapper sensors
[E84-10184] N84-31755
SPECTRAL SIGNATURES
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333
Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper
[E84-10056] N84-31731
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia
[E84-10189] N84-31760
SPECTRAL THEORY
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1
[AD-A143085] N84-32015
SPECTROGRAPHS
Diagnostics for an XUV/soft X-ray laser
[DE84-012593] N84-31628
SPECTROMETERS
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
SPECTROPHOTOMETERS
Geophysical monitoring for climatic change Number 11,
[PB84-181841] N84-31683
SPECTROPHOTOMETRY
A modified standard method for the determination of ozone residual concentration by spectrophotometry
[PB84-204684] N84-31335
SPECTROSCOPY
Analysis of moisture in solids: A review of the last decade or from Pande to the present
[DE84-011166] N84-31326
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Source of optical pumping for high-resolution spectroscopy with semiconductor laser N84-32070
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32061
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
SPECTRUM ANALYSIS
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
SPEECH
Results of investigation of adaptive speech codes N84-31426
SPEECH RECOGNITION
The discrimination of pitch in pulse trains and speech
[AD-A142996] N84-32127
SPHERES
User's guide to Sphere and Plate Interactive Display Routine (SPIDR)
[DE84-012655] N84-31976
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology
[BMFT-FB-T-84-094] N84-32178
SPHERICAL WAVES
Realization of high-frequency filters according to theory of guided spherical waves N84-31438
SPIN DYNAMICS
A study of a two-frequency NMR maser N84-31615
The nonlinear dynamics of spinning paraboloidal antennas N84-32033
SPINE
Simulated crash decelerations in a light aircraft cabin
[AD-A142806] N84-31102
SPLASHING
Splash and spray from road vehicles and associated topics: A bibliography
[CAR-8425] N84-31557
SPLINE FUNCTIONS
Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines
[AD-A142843] N84-32003
On the controlled approximation order from certain spaces of smooth bivariate splines
[AD-A142868] N84-32004
Convergence of bivariate cardinal interpolation
[AD-A142894] N84-32006
Spline approximation for retarded systems and the Riccatti equation
[AD-A142963] N84-32010
SPLITTING
Flux-vector splitting and Runge-Kutta methods for the Euler equations
[NASA-CR-172415] N84-31993
SPOILERS
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
Jet spoiler arrangement for wind turbine
[DE84-011303] N84-31787
SPOOLS
Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests
[DE84-012373] N84-31295
SPRAY CHARACTERISTICS
Splash and spray from road vehicles and associated topics: A bibliography
[CAR-8425] N84-31557
SPRAYED COATINGS
Surface modification and coatings: A technical assessment
[DE84-012483] N84-31366
SPRAYERS
On orbit surfacing of thermal control surfaces
[NASA-CR-171121] N84-31266
SPRAYING
Splash and spray from road vehicles and associated topics: A bibliography
[CAR-8425] N84-31557
SPUTTERING
Dual ion beam deposition of carbon films with diamondlike properties
[NASA-TM-83743] N84-31512
STABILITY
An on-line equivalent system identification scheme for adaptive control N84-31213
Cold-cathode gas-discharge modulator power tube N84-31443
The effects of internal stress and phase transformations on fracture N84-31671
Stability and convergence of underintegrated finite element approximations N84-31696
Variance-stable R-estimators
[AD-A143172] N84-32024
Stability of stationary rotation of cylinder filled with stratified viscous incompressible fluid N84-32054
Longitudinal and transverse instabilities in a high current modified betatron electron accelerator
[AD-A142822] N84-32132
STABILIZERS (FLUID DYNAMICS)
Pitch control of a satellite using stabilizing flaps
[INPE-3185-PRE/550] N84-31246
STABLE OSCILLATIONS
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142966] N84-31622
STAGNATION FLOW
Another look at the use of complex sources for the generation of bodies of revolution in incompressible flow
[CAR-8412] N84-31555
STAINLESS STEELS
Environmentally-controlled crack growth rate of type 304 stainless steel in high temperature sulfate solutions N84-31342
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions
[DE84-001300] N84-31359
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790
STAMPING
Forging and stamping nonferrous metals. Handbook
[AD-A141669] N84-31351
Automation of a stamping press using sequential hydraulic manipulators
[CETIM-1-4N-090] N84-31422
STANDARDIZATION
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 1
[AD-A142778] N84-31121
J73AVS: A JOVIAL J73 automated verification system
[AD-P003521] N84-31125
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software
[AD-P003524] N84-31128
Signal set standardization for the aircraft-store electrical interconnection system
[AD-P003528] N84-31132
Consideration of MIL-STD-1760, aircraft/store electrical interface standard on stores management system architectures
[AD-P003529] N84-31133
The NEBULA and MCF (Military Computer Family) standardization programs
[AD-P003531] N84-31135
The NEBULA standard computer architecture
[AD-P003532] N84-31136
Data word standardization
[AD-P003543] N84-31147

Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 2
[AD-A142777] N84-31165
Achieving the benefits of modular avionics design
[AD-P003562] N84-31167
Standard ISAs (Instruction Set Architectures) and VLSI (Very Large Scale Integration): Two interacting trends
[AD-P003563] N84-31168
Navy packaging standardization thrusts
[AD-P003564] N84-31169
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003577] N84-31182
Proposed MIL-STD for avionics installation interfaces
[AD-P003578] N84-31183
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185
Quantum leap in avionics
[AD-P003584] N84-31189
Standardized computing system SDS80
[AD-P003585] N84-31190
Tri-service Combined Altitude Radar Altimeter (CARA): The Army perspective
[AD-P003586] N84-31191
MATE standardization
[AD-P003587] N84-31192
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 3: Embedded computer resources governing documents
[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207

STANDARDS

Management overview of the benefits of efficient JOVIAL J73/1750A software tools
[AD-P003519] N84-31123
MIL-STD-1760 development program
[AD-P003526] N84-31130
MIL-STD-1750A users group
[AD-P003547] N84-31151
MIL-STD-1750A microprocessor chip set development
[AD-P003548] N84-31152
The use of computer ISA (Instruction Set Architectures) and software standards at Westinghouse Defense Electronics Center
[AD-P003552] N84-31156
Transportable GPU (General Processor Units) chip set technology for standard computer architectures
[AD-P003553] N84-31157
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166
Achieving the benefits of modular avionics design
[AD-P003562] N84-31167
Standard ISAs (Instruction Set Architectures) and VLSI (Very Large Scale Integration): Two interacting trends
[AD-P003563] N84-31168
An introduction to the avionics integrity program
[AD-P003565] N84-31170
Elements for successful implementation of computing standards
[AD-P003566] N84-31171
The application of standards to the TDY-750 (TIGERSHARK) mission computer
[AD-P003567] N84-31172
Defense industry attitudes about AF interface standards report of an electronics industries association survey
[AD-P003570] N84-31175
Westinghouse uses USAF-developed standards
[AD-P003572] N84-31177
An integrated approach to a successful embedded computer resource project
[AD-P003574] N84-31179
MIL-PRIME Program System
[AD-P003576] N84-31181
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003577] N84-31182
Proposed MIL-STD for avionics installation interfaces
[AD-P003578] N84-31183
Fiber optics for the future - wavelength division multiplexing
[AD-P003579] N84-31184
A corporate approach to an embedded software development and support standard
[AD-P003589] N84-31194
MIL-STD defense system software development
[AD-P003590] N84-31195
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
Guidelines for testing and release procedures
[NASA-CR-166581] N84-31962
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271

STARK EFFECT

Optical stark effect in the 2-photon spectrum of NO
[NASA-TM-85964] N84-32131

STARS

Optical and infrared polarization as a probe of matter near stars N84-32324

STATIC CHARACTERISTICS

The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680

STATIC LOADS

Results of the first complete static calibration of the RSRA rotor-load-measurement system
[NASA-TP-2327] N84-31111
Strength and stiffness of AISC type 2 steel frames N84-31666

STATIC TESTS

Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites
[SNIAS-841-551-102] N84-31298

STATISTICAL ANALYSIS

The APL RCS (Radar Cross Section)/statistics code description, illustrations of output, and user's guide
[AD-A142929] N84-31490
Statistical tests for detecting crustal movements using Bayesian inference
[PB84-196811] N84-31661
Regional Wind Energy Assessment Program report. Appendix: Wind statistics summaries
[DE84-011835] N84-31876
Regional wind energy assessment program
[DE84-011832] N84-31878
Assessment of local influence
[AD-A143002] N84-32014
The use of double sampling in studying robustness
[AD-A142982] N84-32022
Weibull analysis handbook
[AD-A143100] N84-32023
A statistical classification model for a database system N84-32279

STATISTICAL DECISION THEORY

Equitable assignment rules
[AD-A142809] N84-32268

STATISTICAL DISTRIBUTIONS

How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704

STATISTICAL MECHANICS

Statistical-mechanical study of polyvinylidene fluoride
[AD-A143040] N84-31383

STATISTICAL TESTS

How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704
An exhaustive analysis of multiplicative congruential random number generators with modulus 2(31)-1
[AD-A143065] N84-32015

STEADY FLOW

Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section
[UTIAS-TN-255] N84-31563

STEADY STATE

Steady state performance of single-phase reaction motor N84-32035

STEAM TURBINES

AFB/open cycle gas turbine conceptual design study
[NASA-CR-168135] N84-31784

STEEL STRUCTURES

Improving comfort of welders by reducing preheating temperatures — steel welding
[CETIM-12-Y-413] N84-31651
Strength and stiffness of AISC type 2 steel frames N84-31666

STEELS

Wear behaviour of steel under the action of granular interfacial minerals
[BLL-CE-TRANS-8002-(9022.09)] N84-31336
Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue
[DE84-012911] N84-31367
Advance in materials technology: Monitor issue number 1
[PB84-196286] N84-31377
Internal grinding of high-speed steels: Shorter processing times with boron nitride grinding tools
[CSIR-TRANS-1719] N84-31421
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-081] N84-31659
Influence of choice of steel on forging
[CETIM-1.3K.32.1] N84-31663

STEERING

Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174871] N84-31274
Antenna pattern characteristics of fine-steered pencil beams
[AD-P003516] N84-31484

STELLAR ATMOSPHERES

Theoretical studies of the pulsar magnetosphere N84-31809

STELLAR COMPOSITION

Line studies of Wolf-Rayet stars: The WN subclass N84-32311

STELLAR ENVELOPES

Study of variable extinction of hot stars with circumstellar dust shells
[NASA-CR-173844] N84-32315
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32328

STELLAR EVOLUTION

Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32328

STELLAR MASS

On the masses of white dwarfs in cataclysmic binaries N84-32323

STELLAR MODELS

Theoretical studies of the pulsar magnetosphere N84-31809
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335

STELLAR RADIATION

Optical and infrared polarization as a probe of matter near stars N84-32324

STELLAR SPECTRA

Line studies of Wolf-Rayet stars: The WN subclass N84-32311
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312
The physical nature of the symbiotic stars N84-32325
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32328

STIFFNESS

Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173866] N84-31214
Strength and stiffness of AISC type 2 steel frames N84-31666
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31686

STIFFNESS MATRIX

Automatic finite element generators N84-31695
Stability and convergence of underintegrated finite element approximations N84-31696

STIMULATED EMISSION

Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094

STIMULATED EMISSION DEVICES

Chemical lasers N84-32093
Multifrequency emission from submillimeter lasers N84-32096

STIRLING CYCLE
Nonlinear analysis of Stirling engine thermodynamics [DE84-013469] N84-32219
Automotive Stirling engine development program [NASA-CR-174622] N84-32305
STOCHASTIC PROCESSES
Attitude determination using strapdown inertial sensors and adaptive estimation [INPE-3180-PRE/545] N84-31106
Investigation and appreciation of optimal output feedback. Volume 1: A convergent algorithm for the stochastic infinite-time discrete optimal output feedback problem [NASA-CR-3628] N84-31217
Investigation, development and application of optimal output feedback theory. Volume 2: Development of an optimal, limited state feedback outer-loop digital flight control system for 3-D terminal area operation [NASA-CR-3629] N84-31218
Resource contention, synchronization, and information structure in distributed systems [AD-A143037] N84-32287
STOICHIOMETRY
Combustion of redox mixes in the Through Bulkhead Initiator (TBI) configuration [SNIAS-841-422-115] N84-31332
Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340
STOPPING POWER
Current status of calculations and measurements of ion stopping power in ICF plasmas [DE84-005860] N84-32187
STORAGE BATTERIES
Emerging battery technologies [DE84-011193] N84-31536
STORAGE RINGS (PARTICLE ACCELERATORS)
Magnetically confined kinetic-energy storage ring: A new fundamental energy-storage concept [DE84-011531] N84-31793
STRAIN GAGE BALANCES
The 6M x 6M low speed wind tunnel N84-31221
STRAIN GAGES
Calibration of CT-4A fatigue test article, March 1983 [AD-A142980] N84-31115
Development of long-length wire filament strain gages [DE84-011543] N84-31605
STRAIN HARDENING
Preliminary study on elastoplasticity in large transformations [CETIM-11-E-360] N84-31719
STRAPDOWN INERTIAL GUIDANCE
Attitude determination using strapdown inertial sensors and adaptive estimation [INPE-3180-PRE/545] N84-31106
STRATA
Free oscillations of ideal stratified fluid in container N84-32058
STRATEGY
Distributed problem solving for air fleet control: Framework and implementation [AD-A143168] N84-31108
An ocean climate research strategy [PB84-184828] N84-31902
STRATIFICATION
Hopf bifurcation in two-component flow [AD-A142844] N84-31568
STRATIFIED FLOW
Thermal oscillations downstream of an elbow in stratified pipe flow [DE84-006550] N84-31579
STRATIGRAPHY
The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31816
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31818
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831
The neogene stratigraphy of the Central Florida Panhandle N84-31833
STRATOSPHERE
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Empirical studies of upper atmospheric species [NASA-CR-172437] N84-31847
The Project STRAFAM: Test of a new parachute based instrument carrier for stratospheric research — dropsondes [BMFT-FB-W-84-021] N84-31859
STREAK PHOTOGRAPHY
A multi-GHz multi-channel photonic analog data processing system [DE84-012261] N84-32175
STREAMS
Mathmatical modeling of longitudinal profile adjustment in alluvial streams N84-31726
Climatic change and streamflow in the southwest [DE84-012658] N84-31776
STRESS (PHYSIOLOGY)
Ergonomic analysis of human operation of video terminal N84-31918
Stress in work N84-31921
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
STRESS (PSYCHOLOGY)
Stress in work N84-31921
STRESS ANALYSIS
Numerical solution of viscoplastic flow problems by augmented lagrangians [AD-A142793] N84-31566
Double arch mirror study. Part 1: Preliminary engineering report [NASA-CR-166589-PT-1] N84-31634
Application of measurements of the propagation velocity of ultrasonic Rayleigh waves to surface inspection of materials [CETIM-15-H-417] N84-31662
Thermal-stress analysis for wood composite blade — horizontal axis wind turbines [NASA-CR-173630] N84-31685
Nonlinear Structural Analysis [NASA-CP-2297] N84-31688
New variational formulations of hybrid stress elements N84-31690
Inelastic and dynamic fracture and stress analyses N84-31697
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Slideline verification for multilayer pressure vessel and piping analysis including tangential analysis [DE84-004333] N84-31711
Engineering basis for selection of positron source material [DE84-011772] N84-32143
STRESS CONCENTRATION
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668
The hole drilling method for residual stress distribution measurement [CETIM-100730] N84-31720
STRESS CORROSION
Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue [DE84-012911] N84-31367
STRESS CORROSION CRACKING
Crack initiation model for stress corrosion cracking alpha-brass [DE84-012637] N84-31712
STRESS CYCLES
Creep-fatigue interactions in advanced eutectic superalloys [AD-A142872] N84-31705
STRESS MEASUREMENT
Calibration of CT-4A fatigue test article, March 1983 [AD-A142980] N84-31115
The effects of deformation mode and microstructure fracture-related properties of Ti alloys [AD-A142891] N84-31353
In situ goniometer [CETIM-5.41.22.0] N84-31609
The hole drilling method for residual stress distribution measurement [CETIM-100730] N84-31720
STRESS RATIO
The effect of finite rotation on a problem in plastic deformation [DE84-012627] N84-31710
STRESS WAVES
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model [AD-A143173] N84-31708
STRESS-STRAIN RELATIONSHIPS
The effect of finite rotation on a problem in plastic deformation [DE84-012627] N84-31710
Statistical inference for reliability from stress strength relationships: The normal case [AD-A142993] N84-32005
STRESSES
Dynamic overstresses in fibrous polymeric materials [DE84-012605] N84-31394
New approach to the effective stress principle [DE84-006963] N84-31574
New variational formulations of hybrid stress elements N84-31690
Interdependence of equivalent steady stress, crack growth and failure on sequence and amplitude of irregular loading [AD-A142951] N84-31707
STRETCHING
A study of the drawing process for optical fibers [AD-A142930] N84-32171
STRIP TRANSMISSION LINES
Broadband microstrip matching techniques [AD-P003506] N84-31474
Wideband microstrip ring radiator [AD-P003507] N84-31475
STRONTIUM ISOTOPES
Geochemistry, age and strontium composition of late tertiary and quaternary basalts and andesites in western Nevada and their relation to geothermal potential [DE84-012404] N84-31852
STRUCTURAL ANALYSIS
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites [AD-A142807] N84-31293
Use of theory of systems with dispersed parameters to formulate deformation resistance equations in pressure working of metals: Communication 2 [BLL-M-35595-(5628.4)] N84-31337
Nonlinear Structural Analysis [NASA-CP-2297] N84-31688
New variational formulations of hybrid stress elements N84-31690
A shear deformable shell element for laminated composites N84-31691
Nonlinear finite element analysis of shells with large aspect ratio N84-31692
Self-adaptive solution strategies N84-31693
Element-by-element solution procedures for nonlinear structural analysis N84-31694
Inelastic and dynamic fracture and stress analyses N84-31697
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Three-dimensional stress analysis using the boundary element method N84-31700
Preliminary study on elastoplasticity in large transformations [CETIM-11-E-360] N84-31719
NONAX-TRANAX-CASTOR 2D — structural analysis programs [CETIM-100940] N84-31721
Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components [AD-A143026] N84-32205
Liquid crystal materials for matrix displays [AD-A143039] N84-32206
STRUCTURAL BASINS
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland [DE84-012114] N84-31772
Climatic change and streamflow in the southwest [DE84-012658] N84-31776
Geology of the Portrerillos District, Atacama, Chile N84-31811
Origin and evolution of the West Philippine Basin N84-31820
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
Geology of the Gualan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
Observations of radiation exchange above and below Amazonian forest [INPE-3194-PRE/558] N84-31870
STRUCTURAL DESIGN CRITERIA
A method for the combination of stochastic time varying load effects N84-31669
Reflight certification software design specifications [NASA-CR-171136] N84-31966
STRUCTURAL ENGINEERING
Double arch mirror study. Part 1: Preliminary engineering report [NASA-CR-166589-PT-1] N84-31634
STRUCTURAL FAILURE
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667
Engineering basis for selection of positron source material [DE84-011772] N84-32143
STRUCTURAL PROPERTIES (GEOLOGY)
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31818

Nonlinear inverse methods applied to interpreting gravity anomalies produced by multi-interfaced geologic bodies N84-31822

STRUCTURAL STABILITY
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173866] N84-31214
Strength and stiffness of AISC type 2 steel frames N84-31666
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668

STRUCTURAL STRAIN
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667

STRUCTURAL VIBRATION
Direct generation of seismic floor response spectra for classically and nonclassically damped structures
[PB84-191675] N84-31560

STRUCTURES
Combined experimental/analytical modeling using component mode synthesis
[DE84-013147] N84-31715

SUBMILLIMETER WAVES
Multifrequency emission from submillimeter lasers N84-32096
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32326

SUBREFLECTORS
Synthesis of offset dual shaped subreflector antennas for control of Cassegrain aperture distributions
[AD-P003517] N84-31485

SUBROUTINE LIBRARIES (COMPUTERS)
METLIB-2: A program library for calculating and plotting atmospheric and oceanic fields
[PB84-205434] N84-31890

SUBROUTINES
Planning of operational software implementation tool
[AD-P003695] N84-31200

SUBSIDENCE
Response of alluvial rivers to active tectonics N84-31812

SUBSTRATES
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83736] N84-31344
Effect of ion treatment of substrates on initial stage of buildup of metal films N84-31439
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519
Nd-3+ Beta prime prime alumina platelet laser
[AD-A142797] N84-31621
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics N84-32052

SUCTION
Stall delay by boundary layer blowing and/or suction N84-31086

SULFATES
Urban and local source effects on precipitation chemistry
[DE84-011848] N84-31603

SUN
The shape of the Sun N84-32334
Observations and analysis of solar flares using H Alpha spectral profiles N84-32335

SUNLIGHT
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334

SUPERCOMPUTERS
Thinking big
[DE84-007412] N84-31951

SUPERCONDUCTING MAGNETS
Normal zone detectors for a large number of inductively coupled coils, revision 1
[DE84-011053] N84-31526
Improved superconducting magnet wire
[DE84-011233] N84-31531
Switching transients in a superconducting coil
[DE84-012592] N84-31532
Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils
[DE84-012602] N84-31534

SUPERCONDUCTIVITY
Operating modes of superconducting current converters in service N84-31445

SUPERCONDUCTORS
Improved superconducting magnet wire
[DE84-011233] N84-31531
Electromagnetic excitation of sound in metals N84-32082
Magnetic impurity scattering in in situ superconductors
[DE84-012635] N84-32212

SUPERHIGH FREQUENCIES
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477

SUPERLATTICES
Superlattice structures grown by molecular beam epitaxy
[DE84-011288] N84-32209

SUPERPLASTICITY
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356

SUPERSONIC AIRCRAFT
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701

SUPERSONIC FLOW
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32088

SUPERSONIC JET FLOW
Supersonic jet-cavity interaction pulsation N84-32089

SUPPORTS
Temperature controlled adjusting mechanism
[AD-D011077] N84-31601
Double arch mirror study. Part 1: Preliminary engineering report
[NASA-CR-166589-PT-1] N84-31634
Retractable tie-down device
[AD-D011079] N84-31643

SUPPRESSORS
Axial-conductance angular filter investigation
[AD-A142802] N84-31487

SURFACE ACOUSTIC WAVE DEVICES
Alternating acoutoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449

SURFACE CRACKS
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83778] N84-31348

SURFACE DEFECTS
Application of measurements of the propagation velocity of ultrasonic Rayleigh waves to surface inspection of materials
[CETIM-15-H-417] N84-31662

SURFACE FINISHING
On orbit surfacing of thermal control surfaces
[NASA-CR-171121] N84-31266
Influence of choice of steel on forging
[CETIM-1.3K.32.1] N84-31663
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology
[BMFT-FB-T-84-094] N84-32178

SURFACE PROPERTIES
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
Investigation of Bragg reflection of electromagnetic surface waves by diffraction grating N84-32053
Focusers of obliquely incident laser radiation N84-32099

SURFACE REACTIONS
Use of surface and thin film analysis techniques to study metal-organic and metal-polymer interaction
[DE84-012542] N84-31321
Simulations of erosion/corrosion surface chemical reactions with a laser beam
[AD-A143001] N84-31354
Perspective of the corrosive behavior of lithium and sodium
[DE84-011635] N84-31362
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142899] N84-31381
Effect of ion treatment of substrates on initial stage of buildup of metal films N84-31439
Energy redistribution in diatomic molecules on surfaces
[DE84-011442] N84-32213

SURFACE TEMPERATURE
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil
[INPE-3214-PRE/567] N84-31867
Monitoring of long waves in the eastern Equatorial pacific 1981-1983 using satellite multi-channel sea surface temperature charts
[PB84-190467] N84-31900

SURFACE TO AIR MISSILES
Advanced Technology for SAM Systems Analysis Synthesis and Simulation
[AGARD-LS-135] N84-31248
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31250
Some aspects of guidance loop design for SAM systems N84-31251
A new concept for guiding missiles with an application to the ground-air system N84-31253
Seeker systems simulation, present capability and future technology N84-31254
Warheads for SAM systems N84-31257

SURFACE VEHICLES
USSR report: Transportation
[JPRS-UTR-84-024] N84-31119

SURFACE WAVES
Transition bifurcation branches in non-linear water waves
[CAR-8418] N84-31556
Finite-amplitude interfacial waves
[AD-A142767] N84-31849

SURGERY
Medical applications of lasers N84-31904

SURGES
Switching transients in a superconducting coil
[DE84-012592] N84-31532

SURVEYS
Defense industry attitudes about AF interface standards report of an electronics industries association survey
[AD-P003570] N84-31175

SUSPENDING (MIXING)
Continuum theory for fiber suspensions
[DE84-012258] N84-31584

SWEPTBACK WINGS
Oscillations of elastic airplane due to wind gust N84-32087

SWITCHES
Digital rotation measurement unit
[DE84-010872] N84-31528
Switching transients in a superconducting coil
[DE84-012592] N84-31532
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536

SWITCHING CIRCUITS
P-I-N Diode Switches Project
[INPE-3171-PRE/541] N84-31516

SYMBIOTIC STARS
The physical nature of the symbiotic stars N84-32325

SYNAPSES
Correlation of afferent activity and binocular receptive field properties
[AD-A143067] N84-31938

SYNCHRONISM
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123
Resource contention, synchronization, and information structure in distributed systems
[AD-A143037] N84-32287

SYNCHRONOUS MOTORS
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Steady state performance of single-phase reaction motor N84-32035

SYNCHROTRON RADIATION
Triply differential studies of atomic and molecular photoionization using synchrotron radiation
[AD-A142834] N84-32133

SYNOPTIC METEOROLOGY
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732

SYNTHESIS
A comparative study of linear array synthesis technique using a personal computer
[AD-P003500] N84-31466

SYNTHESIS (CHEMISTRY)
Mechanistic studies of catalytic methanol synthesis
[DE84-006360] N84-31306

SYNTHETIC APERTURE RADAR
Synthetic aperture radar simulation
[AD-P009474] N84-32248
SYNTHETIC FUELS
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214294] N84-31417
SYSTEM EFFECTIVENESS
Variability of practice and the transfer of training of motor skills
[AD-A142696] N84-31942
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P009455] N84-32232
An evaluation of the system 2000 data base management system for use in major item system mapping
[DE84-013130] N84-32296
SYSTEM FAILURES
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31488
Intelligent instruments for process measurement techniques (monitoring of sensors)
[BMFT-FB-T-84-076] N84-31611
SYSTEM GENERATED ELECTROMAGNETIC PULSES
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268
SYSTEMS
One method of assessing the validity of organizational-systems modelling
[BLL-M-35805-(5828.4)] N84-32222
SYSTEMS ANALYSIS
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P009598] N84-31193
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31250
Space Station Systems Analysis Study. Volume 1: Executive summary, part 1 and 2
[NASA-CR-161580] N84-31263
Space Station Systems Analysis Study. Volume 2: Program review report
[NASA-CR-161231] N84-31264
Space Station Systems Analysis Study. Volume 2: Program options, book 1, parts 1 and 2
[NASA-CR-161927] N84-31265
Rationale for US DOE energy storage program in hydrogen technology
[DE84-010225] N84-31411
Test means and methods linked to experiments on systems — electromagnetic pulse effects
[SNIAS-841-422-110] N84-31508
Lower confidence bounds on system reliability using component data: Maximum methodology
[DE84-012813] N84-31658
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
Specifying the behavior of concurrent systems
[NASA-CR-173830] N84-31957
Guide to computer-based training
[DE84-012244] N84-31975
Activities in applied systems analysis N84-32026
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306
SYSTEMS COMPATIBILITY
Logistic support: A computer manufacturer's viewpoint
[AD-P009496] N84-32262
SYSTEMS ENGINEERING
Achieving the benefits of modular avionics design
[AD-P009582] N84-31167
Some aspects of guidance loop design for SAM systems N84-31251
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
Specifying the behavior of concurrent systems
[NASA-CR-173830] N84-31957
Implementation of INTERLISP on the VAX
[AD-A141707] N84-31967
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P009460] N84-32237
SYSTEMS INTEGRATION
Software modifications to the Demonstration Advanced Avionics Systems (DAAS)
[NASA-TM-85942] N84-31105
Standards and integrated avionic digital system architecture
[AD-P009561] N84-31166
PAVE PILLAR: A maturation process for an advanced avionics architecture
[AD-P009568] N84-31173
Advanced cockpit-systems integration
[AD-P009569] N84-31174
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P009580] N84-31185
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 3: Embedded computer resources governing documents
[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
Guidelines for testing and release procedures
[NASA-CR-166581] N84-31962
Study of numerical control systems for machines. Integration in flexible workshops and units
[CETIM-1.3T.042] N84-31991
SYSTEMS MANAGEMENT
Software control and system configuration management: A systems-wide approach
[NASA-TM-85909] N84-31112
Feasibility study of a low cost Energy Performance Management System (EPMS) — automatic flight control
[BMFT-FB-W-84-015] N84-31116
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
An evaluation of the system 2000 data base management system for use in major item system mapping
[DE84-013130] N84-32296
SYSTEMS SIMULATION
Advanced Technology for SAM Systems Analysis Synthesis and Simulation
[AGARD-LS-135] N84-31248
SYSTEMS STABILITY
Operational performance of the Antares alignment system
[DE84-012659] N84-31632
Analysis of wind turbines in yaw
[DE84-013620] N84-31794

T

TACTICS
The Multiple System OFP Support (MSOS) system, a Pre-PMRT capability for evaluating tactical software
[AD-P009524] N84-31128
TANTALUM ALLOYS
Engineering basis for selection of positron source material
[DE84-011772] N84-32143
TANTALUM CARBIDES
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet
[NASA-TM-83757] N84-31283
TARGET ACQUISITION
Warheads for SAM systems N84-31257
TARGET RECOGNITION
LANTIRN (Low Altitude Navigation and Targeting Infrared System for Night) - tommorrow's software development today
[AD-P009563] N84-31188
TARGETS
Warheads for SAM systems N84-31257
Using information on tangential target motion in space-time signal processing N84-32101
Current status of calculations and measurements of ion stopping power in ICF plasmas
[DE84-006880] N84-32187
TASK COMPLEXITY
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31927
TATB
Method of making fine-grained triaminotrinitrobenzene
[DE84-012754] N84-31413
TDR SATELLITES
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
TEA LASERS
Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094
TEACHING MACHINES
Special features of information presentation in teaching systems
[BLL-M-35604-(5828.4)] N84-32273
TEARING MODES (PLASMAS)
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197
TECHNICAL WRITING
Practical writing and editing techniques
[DE84-012642] N84-32294
TECHNOLOGIES
Broadband cavity-backed slot using printed circuit technology
[AD-P009508] N84-31476
Directory of computerized data files, 1984
[PB84-160125] N84-32309
Technology, innovation and regional economic development. Background paper 2: Encouraging high-technology development
[PB84-180181] N84-32310
TECHNOLOGY ASSESSMENT
National Airspace Review: Implementation plan N84-31107
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013066] N84-31328
Automation of a stamping press using sequential hydraulic manipulators
[CETIM-1-4N-090] N84-31422
Embedded information transfer technology assessment
[AD-A142649] N84-31518
State of technology of direct contact heat exchanging
[DE84-012824] N84-31585
State of techniques for crackling varnishes and problems posed by their application
[CETIM-1.5C.23.1] N84-31723
Activities of the Remote Sensing Information Sciences Research Group
[E84-10177] N84-31739
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-017] N84-31924
Microgravity Science Applications Bibliography: 1984 revision
[NASA-TM-86651] N84-32283
Technology, innovation and regional economic development. Background paper 2: Encouraging high-technology development
[PB84-180181] N84-32310
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Technology Panel reports N84-32320
TECHNOLOGY TRANSFER
Microgravity Science Applications Bibliography: 1984 revision
[NASA-TM-86651] N84-32283
Technology transfer revisited
[DE84-012233] N84-32293
TECHNOLOGY UTILIZATION
Modern structure materials: Present situation and evolution perspectives — aircraft construction materials
[SNIAS-841-551-103] N84-31118
Practical applications of a space station
[NASA-CR-173672] N84-31270
Investigations of mechanical properties of high strength steels and their suitability for glass lining
[BMFT-FB-T-84-076] N84-31370

Preliminary investigations of means to transfer computer programs to the forging industry
[CETIM-1.3K.38.2] N84-31983
Text processing in the writing of contracts
[SNIAS-841-422-102] N84-32297

TECTONICS
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
Response of alluvial rivers to active tectonics N84-31812
Convergence tectonics of the Peru Trench: 8 deg S - 15 deg S latitude N84-31824
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327

TELECOMMUNICATION
Practical applications of a space station
[NASA-CR-173672] N84-31270
Analysis of noise temperature of optical waveguide N84-31434
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
Classification management. Journal of the national classification management society, volume 19, 1983
[AD-A143015] N84-32288

TELECONFERENCING
Voice integrated presentation system
[AD-D011076] N84-31495

TELEMETRY
A rocket-borne Langmuir probe for in-situ measurement of ionospheric plasma
[INPE-3206-PRE/584] N84-31244

TELEOPERATORS
Teleoperator human factors study
[NASA-CR-171120] N84-31944

TELEPHONY
Digital transmission: 68Mbit/s pal field trial system
[BBC-RD-1984/5] N84-31455
Voice integrated presentation system
[AD-D011076] N84-31495

TELESCOPES
The shape of the Sun N84-32334

TELEVISION EQUIPMENT
Equipment for monitoring and control of television transmitters N84-31435

TELEVISION SYSTEMS
WARN: A warning formatter
[PB84-204551] N84-31985

TELEVISION TRANSMISSION
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431

TEMPERATURE CONTROL
Temperature controlled adjusting mechanism
[AD-D011077] N84-31601

TEMPERATURE DEPENDENCE
Temperature dependence of the Raman OH-stretching overtone from liquid water
[AD-A143131] N84-31305
Use of pulse radiolysis to measure high temperature kinetics
[DE84-011702] N84-31324
Simulation of vibratory processes in damped structures with temperature-frequency characteristics of vibration absorbing materials taken into account N84-32046
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210

TEMPERATURE DISTRIBUTION
Laser window with annular grooves for thermal isolation
[DE84-011114] N84-31625
Mathematical model for a simplified Bridgman-Stockberger crystal growing system
[NASA-CR-171108] N84-32202

TEMPERATURE EFFECTS
Temperature derivatives of elastic stiffnesses and frequency-temperature behavior of quartz crystal plates N84-31675
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy
[AD-A142059] N84-31702
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038

TEMPERATURE GRADIENTS
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range
[DE84-012545] N84-31771
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31846
Discussion of the Ionian and Levantine Seas
[DE84-011562] N84-31898

TEMPERATURE MEASURING INSTRUMENTS
Thermocouple simulation: A calibration technique
[DE84-012408] N84-31606

TEMPERATURE PROFILES
Temperature oscillations and ozone correlations in the lower stratosphere of Natal (6 deg S)
[INPE-3116-PRE/512] N84-31844
Temperature profiles from Salt Valley, Utah
[DE84-900896] N84-31854
Acoustic propagation in a thermally stratified atmosphere
[NASA-CR-173663] N84-32121

TEMPERATURE SENSORS
Intelligent instruments for process measurement techniques (monitoring of sensors)
[BMFT-FB-T-84-078] N84-31611

TENSILE STRENGTH
The changes in the compressive and tensile yield strengths during uniaxial cyclic loading N84-31674

TENSILE STRESS
Improvement of the equipment of very long horizontal tensile test bench
[CETIM-5.510.05] N84-31724
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
[AD-A143142] N84-32172

TENSILE TESTS
Characterization of common steels. Report of partial test Number M6-645900, Number 4 N84-31376

TERMINAL GUIDANCE
Terminal control for command to line of sight guided missile N84-31252

TERRAIN ANALYSIS
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31768

TEST EQUIPMENT
Construction of a test bench for closed die forging
[CETIM-5.580.50] N84-31425

TEST FACILITIES
MIL-STD-1553B validation testing
[AD-P003544] N84-31148
Test rig for measuring hydraulic equipment noise
[CETIM-41-H-337] N84-31224

TEST VEHICLES
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101
The Electric Vehicle Project
[DE84-011788] N84-32309

TEXAS
Lineaments of Texas: Possible surface expressions of deep-seated phenomena
[DE84-010827] N84-31858

TEXTS
Page indexing for textual information retrieval systems N84-32277
Text processing in the writing of contracts
[SNIAS-841-422-102] N84-32297

TEXTURES
Properties of bubble domains in cholesteric-nematic mixtures N84-32039

THEMATIC MAPPING
Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper
[E84-10056] N84-31731
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737
Habitability of the Earth N84-31740
NASA pilot land data system N84-31741
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31768

THEORETICAL PHYSICS
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Applied chromodynamics
[DE84-009136] N84-32152
Theoretical high energy physics
[DE84-011854] N84-32153
Solid state research
[AD-A142991] N84-32204

THERMAL ANALYSIS
Holographic investigation of thermal nonequilibrium vapor generation
[DE84-011905] N84-31607

THERMAL CONDUCTIVITY
Temperature profiles from Salt Valley, Utah
[DE84-900896] N84-31854
Cooling of semiinfinite body under conditions of nonlinear heat transfer at surface N84-32075

THERMAL CONTROL COATINGS
On orbit surfacing of thermal control surfaces
[NASA-CR-171121] N84-31266
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268
Testing of coatings in space, Long Duration Exposure Facility (LDEF)
[BMFT-FB-W-84-017] N84-31269
Failure analysis of plasma-sprayed thermal barrier coatings
[NASA-TM-83777] N84-31347

THERMAL CYCLING TESTS
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345

THERMAL DECOMPOSITION
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
CO2 laser decomposition of the alkyl phosphites N84-31402

THERMAL DEGRADATION
Characterization and degradation studies on synthetic polymers for aerospace application
[NASA-CR-166597] N84-31284

THERMAL INSULATION
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561

THERMAL PLASMAS
Bremsstrahlung from longitudinal plasma waves produced by subthermal electrons in plasma N84-32102

THERMAL PROTECTION
Aerothermal loads analysis for high speed flow over a gulfed surface configuration
[NASA-TM-86280] N84-31560

THERMAL RADIATION
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285

THERMAL SHOCK
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672

THERMAL STABILITY
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386

THERMAL STRESSES
Characterization of thermo-mechanical fatigue N84-31673
Thermal-stress analysis for wood composite blade --- horizontal axis wind turbines
[NASA-CR-173830] N84-31685

THERMIONICS
Development of thermionic integrated circuits for applications in hostile environments
[DE84-011374] N84-31533

THERMOCOUPLE PYROMETERS
Thermocouple simulation: A calibration technique
[DE84-012408] N84-31606

THERMOCOUPLES
Method and apparatus for measuring response time --- thermocouples
[DE84-011042] N84-31603

THERMODYNAMIC EFFICIENCY
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510

THERMODYNAMIC EQUILIBRIUM
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302

THERMODYNAMIC PROPERTIES
Property screening and evaluation of ceramic turbine materials
[AD-A142739] N84-31210
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

THERMODYNAMICS
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386
Water vapor electrolysis: Systems considerations and cost/performance benefits
[DE84-007360] N84-31410
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
START/TM: A study of start-up and fractional power operation of tandem mirror fusion reactors
[DE84-011477] N84-32196
Predictions of entropies of molecules and liquids
[DE84-010504] N84-32216
Nonlinear analysis of Stirling engine thermodynamics
[DE84-013493] N84-32219

THERMOELASTICITY
Extension of finite element programs to thermoelastoviscoplastic domains
[CETIM-11-A-102] N84-31716
Transient 3-dimensional thermoelasticity by the integral equations method
[CETIM-11-B-071] N84-31717

THERMOELECTRIC GENERATORS
Power flattening techniques for radioisotopic thermoelectric generators
[AD-A142937] N84-31520

THERMOGRAVIMETRY
Calorimetric and thermogravimetric analysis applied to industrial polymers
[SNIAS-841-551-101] N84-31399

THERMOMECHANICAL TREATMENT
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386
Characterization of thermo-mechanical fatigue N84-31673

THERMOPLASTICITY
Extension of finite element programs to thermoelastoviscoplastic domains
[CETIM-11-A-102] N84-31716

THERMOREGULATION
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931

THERMOSPHERE
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31847
Atomic carbon in the Venus thermosphere: Observations and theory N84-32332

THICK FILMS
Axial-conductance angular filter investigation
[AD-A142802] N84-31487

THICK WALLS
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099

THIN FILMS
Use of surface and thin film analysis techniques to study metal-organic and metal-polymer interaction
[DE84-012542] N84-31321
Dual ion beam deposition of carbon films with diamondlike properties
[NASA-TM-83743] N84-31512
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519
SERI photovoltaics advanced research and development: FY 1983 accomplishments
[DE84-004493] N84-31789
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214

THIN WALLED SHELLS
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561
NONAX-TRANAX-CASTOR 2D — structural analysis programs
[CETIM-100940] N84-31721

THIN WALLS
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099
Oscillations of elastic airplane due to wind gust N84-32087

THOMSON SCATTERING
Thomson backscattering from an intense relativistic electron beam as a diagnostic for a free electron laser
[AD-A143027] N84-31623
A new model of Raman spectra in laser produced plasma
[DE84-009625] N84-32188

THREE AXIS STABILIZATION
Differential equations for movement of triaxial gyroscopic stabilizer on moving base N84-32107

THREE BODY PROBLEM
Computer simulation of surface and film processes
[NASA-CR-173682] N84-31682

THREE DIMENSIONAL FLOW
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85986] N84-31092
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
Hypersonic three-dimensional flow of radiating gas around wing N84-32062

THREE DIMENSIONAL MOTION
A three-dimensional ray method and its application to the study of wave propagation in crustal structure with curved layers N84-31821

THUNDERSTORMS
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31868
Measurements inside Oklahoma thunderstorms
[PB84-206911] N84-31891
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31896
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258

TILES
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561

TIME DEPENDENCE
Time-dependent oscillations in a CW HF chemical laser unstable resonator
[AD-A142966] N84-31622
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Time dependent wave envelope finite difference analysis of sound propagation
[NASA-TM-83744] N84-32118
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336

TIME FUNCTIONS
Comparison of simulation and measurement techniques for continuous waves and pulses
[SNIAS-841-422-103] N84-31501

TIMING DEVICES
Method and apparatus for measuring response time — thermocouples
[DE84-011042] N84-31603

TIRES
Holographic test procedures for the evaluation of complicated material composites (tires)
[BMFT-FB-T-84-096] N84-31612

TISSUES (BIOLOGY)
Effects of microwaves on cell membrane permeability
[AD-A142979] N84-31913
Resolution and quantitative accuracy improvements in ultrasound transmission imaging N84-32113

TITAN
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331

TITANIUM
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790

TITANIUM ALLOYS
Powder metallurgy of light metal alloys for demanding applications
[AD-A142066] N84-31352

TITANIUM CARBIDES
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297

TOKAMAK DEVICES
Ray tracing study of electron cyclotron heating in the TBR 2 Tokamak
[INPE-3192-PRE/556] N84-32181
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185
High power neutral beam heating on Doublet 3
[DE84-012471] N84-32186
Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-006855] N84-32191
Disruptive instabilities in a poloidal divertor tokamak
[DE84-013054] N84-32192
Electromagnetic theory of an antenna for ICR heating of a plasma in Tokamaks
[DE84-012988] N84-32200

TOLERANCES (PHYSIOLOGY)
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Annoyance caused by propeller airplane flyover noise
[NASA-TP-2356] N84-32124

TOMOGRAPHY
Resolution and quantitative accuracy improvements in ultrasound transmission imaging N84-32113

TOOLING
Front lighted optical tooling method and apparatus
[DE84-011108] N84-31602

TOPOGRAPHY
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31768
An approach to a standardized simulator data base
[AD-P003469] N84-32244

TOROIDAL PLASMAS
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185
High power neutral beam heating on Doublet 3
[DE84-012471] N84-32186
A survey of the methods of MHD analysis of magnetic islands
[DE84-006858] N84-32197

TORQUE
Testing and evaluation of Veapel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639
Steady state performance of single-phase reaction motor N84-32035

TORSION
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114
Cyclic torsion testing
[NASA-TM-83756] N84-31687
Oscillations of elastic airplane due to wind gust N84-32087

TORSIONAL VIBRATION
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114

TOWED BODIES
Deep-Towed Array Geophysical System (DTAGS): A hardware description
[AD-A142970] N84-31851

TOXIC HAZARDS
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-188655] N84-32301

TOXICOLOGY
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-188655] N84-32301

TRADEOFFS
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P003455] N84-32232

TRAILING EDGES
Theoretical and experimental investigations of asymmetric turbulent supersonic free shear layers N84-31088

TRAINING AIRCRAFT
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114

TRAINING ANALYSIS
Ada (Trademark) training considerations
[AD-P003560] N84-31164
Marine Corps ground simulator training needs in the 1985-1995 time frame
[AD-P003485] N84-32242
Special features of information presentation in teaching systems
[BLL-M-35604-(5828.4)] N84-32273

TRAINING DEVICES
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
A wide field-of-view CRT projection system with optical feedback for self alignment
[AD-P003447] N84-32224
Image generator architectures and features
[AD-P003449] N84-32226
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228
On-line task analyses in maintenance simulation
[AD-P003452] N84-32229
Concurrency of design criteria: A key to trainer readiness
[AD-P003454] N84-32231
Determining cost and training effectiveness tradeoffs for trainer design: Test of an experimental model
[AD-P003455] N84-32232
Cost-effective and efficient maintenance training devices: A user accepted design process
[AD-P003456] N84-32233
Training capabilities: The facility part of the equation
[AD-P003457] N84-32234
DMA and CIG: A shotgun wedding
[AD-P003459] N84-32236
An adaptive CBT (Computer Based Training) courseware authoring system to meet the needs of military authors
[AD-P003460] N84-32237
User friendly authoring languages: An alternative approach
[AD-P003461] N84-32238
Effectiveness of multi-year and advance procurement contracts
[AD-P003462] N84-32239
Managing aircraft/simulator concurrency
[AD-P003463] N84-32240
Managing a low quantity, high technology trainer development program
[AD-P003464] N84-32241
VHSIC (Very High Speed Integrated Circuits) for training systems
[AD-P003484] N84-32251
Microprocessors in aircrew training devices
[AD-P003485] N84-32252
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260
Automated software testing
[AD-P003498] N84-32264

TRAINING EVALUATION
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266

TRAINING SIMULATORS
Closing the gap between aircraft and simulator training with Limited Field-Of-View (LFOV) visual systems
[AD-P003448] N84-32225
Pilot oriented performance measurement
[AD-P003450] N84-32227
Marine Corps ground simulator training needs in the 1985-1995 time frame
[AD-P003465] N84-32242
An approach to a standardized simulator data base
[AD-P003469] N84-32244
Synthetic aperture radar simulation
[AD-P003474] N84-32246
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training
[AD-P003481] N84-32248
Microprocessors in aircrew training devices
[AD-P003485] N84-32252
Increased readiness through modularity
[AD-P003491] N84-32257
Profit responsibilities in the simulation and training equipment industry
[AD-P003497] N84-32263

TRANSDUCERS
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112

TRANSFER FUNCTIONS
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734

TRANSFER OF TRAINING
Variability of practice and the transfer of training of motor skills
[AD-A142996] N84-31942

TRANSFERRING
Transfer during sliding wear of selected metal systems N84-31341

TRANSFORMATIONS (MATHEMATICS)
Globally convergent procedures for solving nonlinear minimization problems
[AD-A142905] N84-32009

TRANSIENT RESPONSE
A shear deformable shell element for laminated composites N84-31691

TRANSISTOR AMPLIFIERS
Equipment for monitoring and control of television transmitters N84-31435

TRANSLATING
Feasibility assessment of JOVIAL to Ada (Trademark) translation
[AD-P003523] N84-31127

TRANSMISSION LINES
Realization of high-frequency filters according to theory of guided spherical waves N84-31436
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491

TRANSMISSION LOSS
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32128

TRANSMISSIONS (MACHINE ELEMENTS)
Advanced system for testing new helicopter transmissions N84-31120

TRANSONIC FLOW
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85966] N84-31092
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85963] N84-31094
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31096
Diffusion transfer during near-sonic turbulence N84-32090

TRANSONIC WIND TUNNELS
Some factors affecting the selection of the type of new transonic tunnel to best meet Australian needs
[AD-A142957] N84-31222

TRANSPORT PROPERTIES
Environment and fracture
[DE84-011454] N84-31360
Transport behavior of multivalent beta aluminas
[AD-A142966] N84-31382
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808

TRANSPORT THEORY
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Azimuthal electric fields and tandem ambipolarity
[DE84-010843] N84-32189

TRANSVERSE WAVES
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045

TRAVELING WAVES
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076

TREES (PLANTS)
Inventory of numeric data for carbon dioxide research, revision 1
[DE84-013683] N84-31881

TRIBOLOGY
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369

TROPICAL REGIONS
Large-scale atmosphere-ocean coupling
[AD-A143162] N84-31873

TROUGHS
On the quasi-periodic microstrip snake antenna with metal trough backing
[AD-P003510] N84-31478

TRUCKS
The acoustic design of outside broadcast vehicles
[BBC-RD-1984/3] N84-31454

TRUSSES
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31867

TSUNAMI WAVES
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901

TUBE GRIDS
Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174671] N84-31274

TUNABLE LASERS
Nonlinear theory of the free-electron laser
[INPE-3193-PRE/557] N84-31618
Multifrequency emission from submillimeter lasers N84-32096
Picosecond parametric optical oscillator with amplification of radiation from tunable semiconductor laser N84-32097

TUNGSTEN ALLOYS
Engineering basis for selection of positron source material
[DE84-011772] N84-32143

TURBINE BLADES
Thermal-stress analysis for wood composite blade — horizontal axis wind turbines
[NASA-CR-173630] N84-31685
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Jet spoiler arrangement for wind turbine
[DE84-011303] N84-31787
Acoustic tests of the MOD-O/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120

TURBOCOMPRESSORS
Positive displacement compounding of a heavy duty diesel engine
[NASA-CR-168286] N84-31641

TURBOGENERATORS
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783

TURBOMACHINERY
Blade endwall flows in an axial flow compressor stage N84-31209
Computational fluid mechanics utilizing the variational principle of modeling damping seals
[NASA-CR-171114] N84-31553
Critical speed of centrifugal pumps N84-31677

TURBOPROP AIRCRAFT
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123

TURBULENCE
Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
Density fluctuations in premixed turbulent flames
[DE84-012065] N84-31322
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31807
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875
Diffusion transfer during near-sonic turbulence N84-32090

TURBULENT BOUNDARY LAYER
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554
Similarity criteria for spectra of pressure fluctuations in turbulent boundary layer at wall N84-32059

TURBULENT FLOW
Theoretical and experimental investigations of asymmetric turbulent supersonic free shear layers N84-31088
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85966] N84-31092
Acoustic excitation: A promising new means of controlling shear layers
[NASA-TM-83772] N84-31096
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Stationary state computational fluid dynamics for aero-propulsion devices N84-31278

Models for calculating reaction rates in turbulent, reacting flows N84-31281
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056
Coefficient of surface friction with turbulent flow in boundary layer N84-32064
Flow structures and their evolution in turbulent shear layer N84-32091

TURBULENT WAKES
Sound field of turbulent wake N84-32048
Formation of coherent structures by acoustical effects in a turbulent wake N84-32055

TWO DIMENSIONAL BODIES
Computer simulation of surface and film processes [NASA-CR-173662] N84-31662

TWO DIMENSIONAL FLOW
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings [NASA-TM-85996] N84-31092
Efficient finite-difference calculation procedure for multi-dimensional fluid flows [DE84-011710] N84-31577
Two-dimensional vapor flow analysis in heat pipes [DE84-012581] N84-31582

TWO PHASE FLOW
Airblast simulations using flux-corrected transport codes [AD-A142820] N84-31567
An investigation of single-substance horizontal two-phase flow [DE84-012292] N84-31587
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590
Holographic investigation of thermal nonequilibrium vapor generation [DE84-011905] N84-31607

U

U.S.S.R.
USSR report: Transportation [JPRS-UTR-84-024] N84-31119

U.S.S.R. SPACE PROGRAM
List of recent Soviet space launches N84-31239

ULTRASONIC CLEANING
Micrometric cleaning of steel tubes through ultrasonic cavitation [REPT-61584] N84-32125

ULTRASONIC FLAW DETECTION
Nondestructive testing of bonding by ultrasonic analysis: Preliminary study report proposed investigation program — metal bonding [CETIM-13-V-010] N84-31660
Computer aided ultrasonic testing [CETIM-15-H-404] N84-31661
Application of measurements of the propagation velocity of ultrasonic Rayleigh waves to surface inspection of materials [CETIM-15-H-417] N84-31662

ULTRASONIC SCANNERS
Instrumentation for real-time ultrasonic sensing of arc welding characteristics [DE84-012536] N84-31649

ULTRASONIC TESTS
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites [AD-A142907] N84-31293

ULTRASONIC WELDING
Real-time ultrasonic sensing of arc welding processes [DE84-005031] N84-31657

ULTRASONICS
Kinetics of complexation of the macrocycles 18C6 and 12C4 ethers with LiAsF-6 in 1,2-dimethoxyethane at 25 deg C [AD-A143066] N84-31304
Real-time ultrasonic sensing of arc welding processes [DE84-005031] N84-31657
USSR report: Physics and mathematics [JPRS-UPM-84-003] N84-32043
Resolution and quantitative accuracy improvements in ultrasound transmission imaging N84-32113

ULTRAVIOLET ABSORPTION
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040

ULTRAVIOLET ASTRONOMY
Results from Astron satellite after one year in orbit N84-31233

ULTRAVIOLET LASERS
How useful are odd-integer half-harmonics [DE84-012392] N84-32190

ULTRAVIOLET RADIATION
Laser induced polymerization reactions in solid propellant binders N84-31403
Optical coating materials for the ultraviolet: Selection and characterization [DE84-011504] N84-31629
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038

ULTRAVIOLET SPECTRA
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch [DE84-009996] N84-32199

ULTRAVIOLET TELESCOPES
Results from Astron satellite after one year in orbit N84-31233

UNIFIED FIELD THEORY
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110
Electroweak interaction parameters [DE84-012910] N84-32159

UNIONS (CONNECTORS)
Shaft coupling device [AD-D011080] N84-31644

UNITED STATES
Climatic change and streamflow in the southwest [DE84-012658] N84-31776
US annual average wind power [DE84-012215] N84-31877

UNIVERSITY PROGRAM
Graduate engineering research participation in aeronautics [NASA-CR-173849] N84-32220

UNSTEADY FLOW
Unsteady aerodynamics of fast moving control surfaces [BMFT-FB-W-84-020] N84-31117
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section [UTIAS-TN-256] N84-31563
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32088

URETHANES
Laser induced polymerization reactions in solid propellant binders N84-31403

USER MANUALS (COMPUTER PROGRAMS)
Extensions and modifications to the ARL point-performance program [AD-A142078] N84-31113
The APL RCS (Radar Cross Section)/statistics code description, illustrations of output, and user's guide [AD-A142929] N84-31490
A method to combine remotely sensed and in situ measurements: Program documentation [E84-10172] N84-31735
Pilot climate data system user's guide [NASA-TM-86064] N84-31956
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1 [NASA-CR-170619] N84-31960
Automated Construction Management System (ACMS). Volume 1: User's guide [AD-A143031] N84-31971
User's guide: Computer program for analysis of two-dimensional beam-columns with nonlinear supports (CBNTBM) [AD-A143170] N84-31974
User's guide to Sphere and Plate Interactive Display Routine (SPIDR) [DE84-012855] N84-31976
DYNA3D user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1 [DE84-012828] N84-31979
NLM (National Library of Medicine) Online Services Reference Manual: Supplement [PB84-166808] N84-32300

USER REQUIREMENTS
MIL-STD-1750A users group [AD-P003547] N84-31151
APSE database user scenario [AD-P003593] N84-31198
Accounting utility for determining individual usage of production level software systems [NASA-CR-172414] N84-31959
Automated Construction Management System (ACMS). Volume 2: Program documentation [AD-A143032] N84-31972
User-friendly software: The role of the user [AD-P003489] N84-32256

UTAH
Temperature profiles from Salt Valley, Utah [DE84-900996] N84-31654

UTILIZATION
Proceedings of the Antenna Applications Symp., volume 2 [AD-A142754] N84-31467

V

VACUUM
Effect of external pressure environment on the internal noise level due to a source inside a cylindrical tank [NASA-TM-85814] N84-31226
Hard Coatings for Tribological Systems Operating under Extreme Conditions [DE84-009960] N84-31369
A review of anode phenomena in vacuum arcs [DE84-012371] N84-31547

VACUUM DEPOSITION
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038

VACUUM SYSTEMS
Metal finishing and vacuum processes groups [DE84-011046] N84-31358

VALIDITY
One method of assessing the validity of organizational-systems modelling [BLL-M-35805-(5828.4)] N84-32222

VALLEYS
The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815

VALVES
Digital rotation measurement unit [DE84-010872] N84-31528

VANES
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig [NASA-TM-83751] N84-31558
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699

VAPOR DEPOSITION
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials [DE84-012867] N84-31309
Surface modification and coatings: A technical assessment [DE84-012483] N84-31396
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig [NASA-TM-83751] N84-31558

VAPOR PRESSURE
Resonance ionization spectroscopy measurement of the vapor pressure of several molecular species [DE84-010656] N84-31624

VAPORIZERS
Holographic investigation of thermal nonequilibrium vapor generation [DE84-011905] N84-31607

VAPORIZING
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet [NASA-TM-83757] N84-31283

VAPORS
Two-dimensional vapor flow analysis in heat pipes [DE84-012581] N84-31582

VARIABILITY
Climatic change and streamflow in the southwest [DE84-012658] N84-31776

VARNISHES
State of techniques for crackling varnishes and problems posed by their application [CETIM-1.5C.23.1] N84-31723

VECTOR ANALYSIS
Multi-criteria approach to selection of optimal connections in large-scale integrated circuits N84-31436
A theoretical study of the energetics and dynamics of high energy inelastic collision processes [AD-A142799] N84-32163

VECTORS (MATHEMATICS)
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087
A model of asynchronous iterative algorithms for solving large, sparse, linear systems [NASA-CR-172418] N84-31968

VEGETATION
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases [NASA-TM-86096] N84-31781

VEGETATIVE INDEX
Habitability of the Earth N84-31740
NASA pilot land data system N84-31741

VELOCITY DISTRIBUTION
Direct generation of seismic floor response spectra for classically and nonclassically damped structures [PB84-191675] N84-31660

VELOCITY MEASUREMENT
Coefficient of surface friction with turbulent flow in boundary layer N84-32064

VENTILATION
Sensitivity to hypoxia in humans N84-31934
VENUS (PLANET)
Atomic carbon in the Venus thermosphere: Observations and theory N84-32332
VENUS ATMOSPHERE
Empirical studies of upper atmospheric species [NASA-CR-172437] N84-31647
Atomic carbon in the Venus thermosphere: Observations and theory N84-32332
VERY LARGE SCALE INTEGRATION
Standard ISAs (Instruction Set Architectures) and VLSI (Very Large Scale Integration): Two interacting trends [AD-P003563] N84-31168
Princeton VLSI project [AD-A142959] N84-31521
HEART OF GOLD: Computer routines for large sparse, least squares computations [PB84-196492] N84-31967
VETERINARY MEDICINE
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-84-017] N84-31924
VHSIC (CIRCUITS)
VHSIC (Very High Speed Integrated Circuits) for training systems [AD-P003484] N84-32251
VIBRATION
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites [AD-A142807] N84-31293
Radial SI latches vibration test data review [NASA-TM-86454] N84-31638
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element [NASA-TM-86456] N84-31639
The Shock and Vibration Digest, volume 16, no. 4 [AD-A141077] N84-31676
The Shock and Vibration Digest, volume 16, no. 7 [AD-A143958] N84-31679
Vibrations and stability of mechanical ystems, 3 N84-31681
Longitudinal vibrations of rods of finite length with radial deformation [AD-A142674] N84-31703
Combined experimental/analytical modeling using component mode synthesis [DE84-013147] N84-31715
VIBRATION DAMPING
Simulation of vibratory processes in damped structures with temperature-frequency characteristics of vibration absorbing materials taken into account N84-32046
VIBRATION EFFECTS
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056
VIBRATION ISOLATORS
Digital control system for space structural dampers [NASA-CR-173867] N84-31267
VIBRATION MODE
Direct generation of seismic floor response spectra for classically and nonclassically damped structures [PB84-191675] N84-31660
VIDEO DATA
Ergonomic analysis of human operation of video terminal N84-31918
Image generator architectures and features [AD-P003449] N84-32226
On-line task analyses in maintenance simulation [AD-P003452] N84-32229
VIKING MARS PROGRAM
Phobos: Close encounter imaging from the Viking Orbiters [NASA-RP-1109] N84-32330
VINYL POLYMERS
Statistical-mechanical study of polyvinylidene fluoride [AD-A143040] N84-31383
VISCOELASTICITY
Viscoelastic and aging characteristics of polymers [DE84-012689] N84-31393
VISCOPLASTICITY
Numerical solution of viscoplastic flow problems by augmented lagrangians [AD-A142793] N84-31566
VISCOSITY
Blade endwall flows in an axial flow compressor stage N84-31209
Hopf bifurcation in two-component flow [AD-A142844] N84-31568
Lubrication of machine elements [NASA-RP-1126] N84-31640
Flux-vector splitting and Runge-Kutta methods for the Euler equations [NASA-CR-172415] N84-31993
Effects of cyclohexyl groups and ortho-substituents on the viscosity of ester liquid crystal components [AD-A143026] N84-32205
Liquid crystal materials for matrix displays [AD-A143039] N84-32206
VISCOUS DRAG
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450
VISCOUS FLOW
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade [NASA-CR-168275] N84-31095
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations [AD-A141634] N84-31564
Stability of stationary rotation of cylinder filled with stratified viscous incompressible fluid N84-32054
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063
VISCOUS FLUIDS
Global solutions for the one-dimensional equations of a viscous reactive gas [AD-A142931] N84-31569
VISUAL AIDS
Visual cueing effectiveness: Comparison of perception and flying performance [AD-P003458] N84-32235
DMA and CIG: A shotgun wedding [AD-P003459] N84-32236
Low-Altitude Database Development Evaluation and Research (LADDER) [AD-P003468] N84-32243
Data base generation: Improving the state-of-the-art [AD-P003470] N84-32245
VISUAL DISCRIMINATION
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
VOCODERS
Results of investigation of adaptive speech codes N84-31428
The discrimination of pitch in pulse trains and speech [AD-A142998] N84-32127
VOICE COMMUNICATION
Development of a computer-assisted simulation of tactical voice communications. Phase 1: Conceptual design [AD-A143036] N84-31492
VOLCANOLOGY
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery — Saudi Arabia [E84-10189] N84-31760
Geology and geochemistry of the Arctic prospect, Ambler District, Alaska N84-31814
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831
VOLT-AMPERE CHARACTERISTICS
Magnetic impurity scattering in in situ superconductors [DE84-012835] N84-32212
VOLTERRA EQUATIONS
Asymptotic estimates for resolvents of some nonintegrable Volterra kernels [AD-A141662] N84-31999
VORTICES
Motion of vortex pair between parallel walls N84-32092
VORTICITY
Conservation laws of wave action and potential enstrophy for Rossby waves in a stratified atmosphere [NASA-TM-86058] N84-31838

W

WALKING
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
WALL FLOW
Similarity criteria for spectra of pressure fluctuations in turbulent boundary layer at wall N84-32059
WALL JETS
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner [AD-A142773] N84-31099
WALLS
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B [DE84-009326] N84-31329
Response of a plaster-wood room subjected to simulated sonic booms [UTIAS-276] N84-31701
Considerations on deformable ability and ultimate strength of aseismic walls. Part 2: About the derivation of a formula on ultimate shearing stress of walls and its applied verification for some experimental results N84-32042
Study of double wall panels for use in propeller driven aircraft [NASA-CR-173847] N84-32116
Prediction of light aircraft interior sound pressure level using the room equation [NASA-CR-173840] N84-32117
WARHEADS
Warheads for SAM systems N84-31257
WARNING SYSTEMS
Selected worldwide marine weather broadcasts [PB84-192855] N84-31894
WARN: A warning formatter [PB84-204551] N84-31995
WASHINGTON
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range [DE84-012545] N84-31771
Low temperature geothermal resource evaluation of the Moses Lake-Ritzville-Connell area, Washington [DE84-012506] N84-31773
WASTE DISPOSAL
Geology hydrology and mineral resources of crystalline rock areas of Northeastern US [DE84-013671] N84-31774
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825
Environmental Research Laboratories publication abstracts, FY 1983 [PB84-189323] N84-31892
Data base management system of the National Low-Level Radioactive Waste Management Program [DE84-012789] N84-32291
WASTE ENERGY UTILIZATION
Waste heat recovery from adiabatic diesel engines by exhaust-driven Brayton cycles [NASA-CR-168257] N84-32307
WASTE HEAT
Survey and assessment of heat of reaction type chemical heat pumps [DE84-010966] N84-31576
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (80 deg C(140 deg F)) waste heat [DE84-013129] N84-31586
Waste heat recovery from adiabatic diesel engines by exhaust-driven Brayton cycles [NASA-CR-168257] N84-32307
WASTE UTILIZATION
Producer gas: Another fuel for motor transport [DE84-901066] N84-31418
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (80 deg C(140 deg F)) waste heat [DE84-013129] N84-31586
Microprocessor enhanced real time manual control of an industrial robot [DE84-011805] N84-31645
WASTE WATER
The use of aquatic plants to purify waste water in recreational waters [REPT-226] N84-31805
WATER
Analytical methods for determination of inorganic anions [BLL-WH-592-(9091.9F)] N84-31301
Temperature dependence of the Raman OH-stretching overtone from liquid water [AD-A143131] N84-31305
Catalyzed photodissociation of water [DE84-012253] N84-31325
Experiments in development of powerful dye laser N84-32095
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers [AD-A143142] N84-32172
WATER CURRENTS
Discussion of the Ionian and Levantine Seas [DE84-011582] N84-31696
WATER FLOW
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows [AD-A143135] N84-31601
WATER POLLUTION
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825

WATER QUALITY
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31601
Ten-year forecasts of water quality in Lake Michigan using a deterministic eutrophication model
[DE84-011425] N84-31604
WATER TEMPERATURE
Temperature dependence of the Raman OH-stretching overtone from liquid water
[AD-A143131] N84-31305
WATER TREATMENT
The use of aquatic plants to purify waste water in recreational waters
[REPT-226] N84-31605
WATER VAPOR
Water vapor electrolysis: Systems considerations and cost/performance benefits
[DE84-007389] N84-31410
Geophysical monitoring for climatic change Number 11,
[PB84-161841] N84-31683
WATER WAVES
Transition bifurcation branches in non-linear water waves
[CAP-8418] N84-31556
Research in nonlinear motion
[AD-A143000] N84-32013
WAVE ATTENUATION
Double scattering background in a CW lidar N84-32072
WAVE DISPERSION
On waves in nonadiabatic and nonequilibrium gases
[AD-A141450] N84-31485
WAVE EXCITATION
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
WAVE FRONTS
Theory of acoustic speckle N84-32114
WAVE INTERACTION
Alternating acoustoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31448
WAVE PROPAGATION
Feedback in separated flows over symmetric airfoils
[NASA-TM-83758] N84-31091
On waves in nonadiabatic and nonequilibrium gases
[AD-A141450] N84-31485
Dynamic characteristic of intense short microwave propagation in an atmosphere
[DE84-002788] N84-31496
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31708
A three-dimensional ray method and its application to the study of wave propagation in crustal structure with curved layers N84-31821
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076
Propagation of nonlinear compression pulses through granular media N84-32106
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
WAVE REFLECTION
Nonstationary oblique-shock-wave reflections in air
[UTIAS-270] N84-31562
WAVEGUIDES
Dielectric-grating band-pass filters N84-31442
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
Waveguide CO2 laser with 7.5 W power rating N84-32098
WAVELENGTH DIVISION MULTIPLEXING
Fiber optics for the future - wavelength division multiplexing
[AD-P003579] N84-31184
WEAK INTERACTIONS (FIELD THEORY)
Electroweak interaction parameters
[DE84-012910] N84-32159
WEAPON SYSTEMS
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166
Elements for successful implementation of computing standards
[AD-P003566] N84-31171
Westinghouse uses USAF-developed standards
[AD-P003572] N84-31177
MIL-PRIME Program System
[AD-P003576] N84-31181
MATE standardization
[AD-P003567] N84-31192
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
VHSIC (Very High Speed Integrated Circuits) for training systems
[AD-P003484] N84-32251
WEAPONS
Data base management of software development
[AD-P003486] N84-32253
WEAPONS DEVELOPMENT
Advanced Technology for SAM Systems Analysis Synthesis and Simulation
[AGARD-LS-135] N84-31248
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31250
WEAR
Wear behaviour of steel under the action of granular interfacial minerals
[BLL-CE-TRANS-8002-(9022.09)] N84-31336
Transfer during sliding wear of selected metal systems N84-31341
Investigation of role of subsurface zones in wear of materials
[DE84-012752] N84-31365
Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
Lubrication during cutting: Wear and friction
[CETIM-13-Y-322] N84-31653
WEAR TESTS
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-081] N84-31659
WEATHER
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
A computer calculation and display station for slosh hurricane surge model data
[PB84-196753] N84-31887
WEATHER FORECASTING
Federal plan for meteorological services and supporting research, fiscal year 1985
[PB84-182732] N84-31884
National Hurricane Operations Plan
[PB84-196837] N84-31886
NETWORK: A user oriented, interactive, station-siting program for NOAA (National Oceanic and Atmospheric Administration) VHF weather radio
[PB84-202233] N84-31978
WARN: A warning formatter
[PB84-204551] N84-31985
WEATHER STATIONS
Computer programs for summarizing climatic data stored in the National Fire Weather Data Library
[PB84-197011] N84-31886
WEIBULL DENSITY FUNCTIONS
Weibull analysis handbook
[AD-A143100] N84-32023
WEIGHT (MASS)
Operation of electric vehicles in the US Department of Energy test program
[DE84-011703] N84-32308
WEIGHTING FUNCTIONS
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142895] N84-32007
WEIGHTLESSNESS
USSR report: Space
[JPRS-USP-84-004] N84-31228
Hypokinesia experiment studies effects of weightlessness N84-31234
WELD STRENGTH
Preliminary investigation of ways to improve the strength of vertical electroslag welding
[CETIM-100-020] N84-31654
WELD TESTS
Development of normalized operative mode for making deposits for chemical analysis in MIG/MAG welding
[CETIM-LS.13.826] N84-31331
Influence of copper on MAG deposits
[CETIM-12-Y-431] N84-31375
Investigation of in position end to end welding of an aluminum alloy by electron beam
[CETIM-12-Y-442] N84-31652
Preliminary investigation of ways to improve the strength of vertical electroslag welding
[CETIM-100-020] N84-31654
WELDABILITY
Influence of copper on MAG deposits
[CETIM-12-Y-431] N84-31375
Improving comfort of welders by reducing preheating temperatures — steel welding
[CETIM-12-Y-413] N84-31651
WELDED JOINTS
Study of different welded nipples in headers
[CRIF-MT-159] N84-31655
WELDING
Study of different welded nipples in headers
[CRIF-MT-159] N84-31655
WETTING
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142899] N84-31381
WHITE DWARF STARS
On the masses of white dwarfs in cataclysmic binaries N84-32323
WICKS
Liquid flow through mesh-wire gauze wicks — models
[NLR-TR-83104-U] N84-31592
WIND (METEOROLOGY)
Research study: Organization and development of organized convection in the boundary layer
[NASA-CR-171115] N84-31552
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31886
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31896
WIND DIRECTION
Surface winds in some Alaskan passes
[PB84-194745] N84-31895
WIND EFFECTS
Synoptic scale wind field properties from the SEASAT SASS
[E84-10169] N84-31732
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
Oscillations of elastic airplane due to wind gust N84-32087
WIND PROFILES
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830
WIND TUNNEL DRIVES
The 6M x 6M low speed wind tunnel N84-31221
WIND TUNNEL TESTS
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142840] N84-31100
Turbulent diffusion behind vehicles: Experiments and verification of roadway models
[PB84-194273] N84-31101
Aerothermodynamic data base, phase C
[NASA-CR-173662] N84-31259
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261
Gasdynamic study of model with combustion in shock tunnel N84-32061
WIND TURBINES
Thermal-stress analysis for wood composite blade — hortzontal axis wind turbines
[NASA-CR-173630] N84-31685
NASTRAN-based computer program for structural dynamic analysis of hortzontal axis wind turbine
[DE84-011257] N84-31713
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783
Jet spoiler arrangement for wind turbine
[DE84-011303] N84-31787

Analysis of wind turbines in yaw
[DE84-013620] N84-31794
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875
US annual average wind power
[DE84-012215] N84-31877
Acoustic tests of the MOD-O/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120
WIND VELOCITY
The 6M x 6M low speed wind tunnel N84-31221
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875
Surface winds in some Alaskan passes
[PB84-194745] N84-31895
WIND VELOCITY MEASUREMENT
Regional wind energy assessment program
[DE84-011832] N84-31878
Airborne wind measurements at Cape Blanco, Oregon
[DE84-013662] N84-31880
WINDOWS (APERTURES)
Laser window with annular grooves for thermal isolation
[DE84-011114] N84-31625
WINDPOWER UTILIZATION
Wind energy: a brief assessment
[DE84-012208] N84-31788
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Regional Wind Energy Assessment Program report. Appendix: Wind statistics summaries
[DE84-011835] N84-31876
US annual average wind power
[DE84-012215] N84-31877
Regional wind energy assessment program
[DE84-011832] N84-31878
WINDPOWERED GENERATORS
Conceptual design of an electrofluid dynamic wind energy system
[DE84-004512] N84-31795
WING PROFILES
Wing design for minimum drag with practical constraints N84-31109
WING TIP VORTICES
Graduate engineering research participation in aeronautics
[NASA-CR-173849] N84-32220
WINGS
Hypersonic three-dimensional flow of radiating gas around wing N84-32062
WINTER
San Juan Mountains avalanche study: Evaluation and prediction of avalanche hazard, meteorological and avalanche observations
[PB84-202704] N84-31778
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783
WIRE
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142975] N84-31491
Improved superconducting magnet wire
[DE84-011233] N84-31531
Magnetic impurity scattering in in situ superconductors
[DE84-012835] N84-32212
WISCONSIN
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1 — Michigan, Wisconsin, and Minnesota
[DE84-012682] N84-31775
WOLF-RAYET STARS
Line studies of Wolf-Rayet stars: The WN subclass N84-32311
WOOD
Thermal-stress analysis for wood composite blade — horizontal axis wind turbines
[NASA-CR-173830] N84-31685
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701
WORD PROCESSING
Data word standardization
[AD-P003543] N84-31147
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295
Text processing in the writing of contracts
[SNIAS-841-422-102] N84-32297
WORK
Equitable assignment rules
[AD-A142809] N84-32268
WORK CAPACITY
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
Effect of body temperature on human work capacity N84-31926
WORKING FLUIDS
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306
WORKLOADS (PSYCHOPHYSIOLOGY)
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
WYOMING
Depositional environment and petrology of the Medicine Peak Quartzite (early proterozoic), southern Wyoming N84-31829
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming N84-31830

X

X RAY ASTRONOMY
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32168
X RAY DIFFRACTION
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
X RAY IMAGERY
Optical density radiation dose relationship — radiography
[CETIM-100680] N84-32162
X RAY LASERS
Soft X-ray laser experiments at Norvette Laser Facility
[DE84-012594] N84-31627
Diagnostics for an XUV/soft X-ray laser
[DE84-012593] N84-31628
X RAY SPECTRA
Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338
X RAY STRESS ANALYSIS
In situ goniometer
[CETIM-5.41.22.0] N84-31609
X RAY TELESCOPES
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32168
X RAYS
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
PIXE and PBFA 2: Pulsed X-ray source feasibility study
[DE84-011535] N84-32155

Y

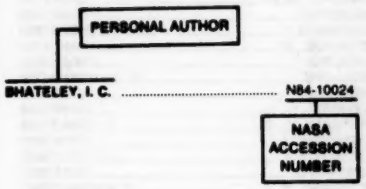
YAW
Analysis of wind turbines in yaw
[DE84-013620] N84-31794

Z

ZINC ALLOYS
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
ZINC OXIDES
Active material redistribution rates in zinc electrodes: Effect of alkaline electrolyte compositions having reduced zinc oxide solubility
[DE84-010709] N84-31525

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

AAS, P. N84-31937
ABBOTT, K. H. N84-31104
ABDU, M. A. N84-31244
N84-31839
ABE, Y. N84-32036
N84-32041
ABEL, I. N84-31684
ABERNETHY, R. B. N84-32023
ABOUL-ATTA, O. N84-31478
ABOULWAFA, M. E. S. N84-31510
ABRAHAMSON, T. E. N84-31672
ABRAMS, R. B. N84-31731
N84-31749
N84-31753
N84-31754
ACHENBACH, J. D. N84-31706
ACREE, C. W., JR. N84-31111
ADABO, P. N84-31515
ADACHI, K. N84-31340
ADAMS, J. E. N84-31978
ADAMS, J. W. N84-31210
ADAMS, M. L. N84-31698
ADAMS, S. E. N84-31199
ADAMS, W. M., JR. N84-31684
AFEYAN, R. N84-32190
AFZALI, M. N84-31722
AGAYAN, G. M. N84-32077
AIHARA, K. N84-32037
AKOPYAN, A. V. N84-32102
ALEKSEYEV, V. N. N84-31452
ALFEROV, G. N. N84-32095
ALFEROV, Z. N84-31235
ALFORD, S. N84-31150
ALFREY, A. N84-31621
ALGER, T. W. N84-31625
ALLAIRE, P. E. N84-31680
ALLEN, H. C. N84-31408
ALLISON, J. E. N84-31353
ALLISON, R. N84-31518
ALMASI, M. H. N84-31730
ALVAREZ, L. M. N84-31803
ALVAREZ, R. A. N84-31496
ALVES, J. R. N84-31844
AMAMIYA, S. N84-32182
AMBALAL, P. K. N84-31295
AMER, N. M. N84-31310
AMINI, M. H. N84-31828
AMODEO, F. A. N84-32267
ANCENAY, H. N84-31397
N84-31398
N84-31680
ANDERSON, J. M. N84-31915
ANDERSON, L. W. N84-32147
ANDERSON, P. J. N84-31594
N84-31598
ANDREWS, A. N84-31093
ANDRONOVA, V. P. N84-31443
ANGUS, J. C. N84-31512
ANHALT, J. N84-31785
ANTAYA, T. A. N84-32151
ANTONCHIK, V. S. N84-32107
ANTONELLI, M. N84-32305
ANZIC, G. N84-31460
N84-31461
AONO, T. N84-32041
APPELBAUM, A. N84-31519
APPERT, Q. D. N84-31632
AQUILINA, C. A. N84-32291
ARABIAN, J. M. N84-31247
ARAKELYAN, S. M. N84-32071
ARMENTROUT, C. J. N84-32186
ARMSTRONG, B. R. N84-31778
ARMSTRONG, R. L. N84-31778
ARNOLD, F. N84-31859
ARNOLDUSSEN, A. H. N84-31777
ARSH, A. M. N84-31443
ARTJUSKOV, E. V. N84-31841
ARZHAKOV, V. M. N84-31351
ARZHANNIKOV, A. V. N84-32104
ASADA, M. K. N84-31708
ASHEROV, A. T. N84-32222
ASKARYAN, G. A. N84-32073
ASSCHER, M. N84-32213
ATAGHI, H. M. N84-31091
ATCHINSON, K. M. N84-32254
ATKINSON, L. N84-31899
ATLURI, S. N. N84-31697
ATTWOOD, D. T. N84-31626
ATWAL, M. N84-32115
N84-32116
N84-32117
AUGUST, C. N84-31603
AUVINE, B. N84-31866
AVDEEV, V. P. N84-32273
AVERBACK, J. N84-31780
AVERIN, A. P. N84-32085
AVERY, D. E. N84-31561
AYERS, O. E. N84-31403
N84-31404
AYZMAN, R. I. N84-31905

B

BABCOCK, S. M. N84-31647
BABENKO, Y. I. N84-32075
BACHALO, W. D. N84-31595
BAGHALL, C. N84-31382
BAKER, R. W. N84-31876
N84-31878
BAKHAREV, V. D. N84-31931
BALDWIN, A. R. N84-31542
BALDWIN, D. M. N84-32247
BALL, D. N84-31749
N84-31754
BALL, D. L. N84-31731
N84-31751
N84-31752
N84-31753
BALLARD, G. K. N84-31561
BANDURIC, R. D. N84-32219
BANERJEE, P. K. N84-31700
BANGERT, H. N84-31380
BANK, R. E. N84-32017
BANTA, R. M. N84-31872
BARAT, C. N84-32337
BARBARIN, P. N84-31609
BARDAKHANOV, S. P. N84-32055
BARHEN, J. N84-31647
BARKALOW, R. H. N84-31383
BARKER, J. L. N84-31731
N84-31749
N84-31750
N84-31751
N84-31752
N84-31753
N84-31754
N84-31755
N84-31756
N84-31757
BARMASHENKO, B. G. N84-31351
BARNES, C. E. N84-31791
N84-32176
N84-32208
BARNES, R. H. N84-31333
BAROCH, P. N84-31774
BARRETT, C. A. N84-31345
BARRY, B. M. N84-31085
BARTON, J. N84-31094
BARVAINIS, R. E. N84-32314
BASCO, D. R. N84-31802
BASHKOVSKIY, A. V. N84-32050
BASOV, N. G. N84-32065
BATALOV, B. V. N84-31436
BATEMAN, J. P. N84-31194
BATES, J. M. N84-31807
BATES, R. L. N84-31967
BATIT, G. N84-31423
N84-31425
BAUER, B. N84-31611
BAUER, H. N84-31269
BAUGHCUM, S. L. N84-31405
BAUMEISTER, K. J. N84-32118
BAUR, J. F. N84-32186
BAYEV, V. K. N84-32061
BEASLEY, R. D. N84-31146
BEAUCHAMP, R. H. N84-31389
BEAUFILS, D. N84-31331
BEAUHAIRE, G. N84-31399
BEBERMEIER, H. N84-31798
BECHER, P. F. N84-31297
BECK, R. W. N84-32240
BECKER, F. N84-31613
BECKER, J. J. N84-31356
BEEUWKES, R., JR. N84-31707
BEGNI, G. N84-31758
BEHNEN, S. W. N84-31167
BELCHENKO, Y. I. N84-32158
BELL, H. H. N84-32227
BELL, Z. W. N84-31976
BELLEM, R. D. N84-31173
BELLER, M. N84-31411
N84-31524
BELLO, P. A. N84-31570
BELYANKO, A. Y. N84-32098
BELYEA, F. S. N84-32239
BENAZET, D. N84-31398
BENDER, S. C. N84-31632
BENEDIC, F. N84-31298
BENNETT, R. B. N84-32191
BENO, M. F. N84-31324
BENTON, D. J. N84-31580
BENTZ, R. R. N84-31608
BENZIGER, T. M. N84-31413
BERGAMIN, E. W. N84-31271
BERGONZ, F. H. N84-31258
BERGSTROM, D. F. N84-31195
BERKELIYEVA, S. C. N84-31907
BERMAN, B. L. N84-32146
BERNARD, G. N84-31224
BERNARD, J. N84-32297
BERNABEK, S. L. N84-31315
BERNDT, C. C. N84-31347
BERNHARD, R. N84-32115
N84-32116
N84-32117
BERRI, D. A. N84-31771
BERTANI, R. T. N84-31827
BERTING, F. M. N84-31989
BETHMANN, R. N84-31116
BHASIN, K. B. N84-31461
BIEHL, F. A. N84-32167
BIREMBAUT, Y. N84-31981
BISHOP, S. G. N84-32211
BISSINGER, H. D. N84-31631
BITTENCOURT, J. A. N84-31839
BLACKETT, R. N84-31760
BLAISDELL, L. N84-31480
BLAKLEY, B. N84-31488
BLANCHARD, J. L., II N84-32128
BLANDER, M. N84-32216
BLASEWITZ, R. M. N84-31160
BLAU, F. P. N84-32186
BLIEK, A. N84-31780
BLOCH, L. N84-31956
BLODGET, H. W. N84-31760
BLUE, R. I. N84-32274

BOASSON, M. N84-31086
BOATMAN, P. J. N84-31129
BOCHAROV, V. N. N84-32195
BOCKAROV, V. N. N84-32194
BOCKHOFF, M. N84-31650
BODE, L. N84-31458
BOCHAINE, B. A. N84-31983
BOERS, R. N84-31807
BOISHAME, J. P. N84-31373
BOISSIN N84-31758
BOLLINGER, L. M. N84-32154
BOLTAR, K. O. N84-32053
BONDARENKO, T. I. N84-32045
BONDAROVSKAYA, V. M. N84-31918
BOOK, D. L. N84-31587
BOOR, C. D. N84-32006
BOOS, F. N84-31116
BOOTHROYD, G. N84-31656
BORELLA, H. M. N84-31624
BORGMAN, C. L. N84-32275
BORISOVA, Y. D. N84-31928
BORLAND, T. N84-31948
BORSE, D. N84-31420
N84-31421
BOTHA, D. N84-31185
BOTKIN, D. N84-31739
BOTKIN, D. B. N84-31740
BOURGICON, C. N84-31424
BOURSE N84-31662
BOWIN, C. O. N84-31736
BOYCHENKO, V. L. N84-32097
BOYER, R. R. N84-31343
BRADACH, I. N84-31431
BRADSHAW, L. S. N84-31686
BRADT, H. V. N84-32337
BRAILE, L. N84-31775
BRAND, A. N84-31683
BRANDHORST, H. W., JR. N84-31513
N84-31782
BRANSON, G. N84-32186
BRAUN, C. L. N84-31164
BREMEMAN, J. E. N84-32023
BREMMECKE, W. N84-31116
BRESSAN, A. N84-31589
N84-32000
BRIDGLAND, M. F. N84-31729
BRINATI, H. L. N84-31243
BRODSKY, S. J. N84-32152
BROOK, M. N84-31597
BROOKS, C. R. N84-31366
BROOKS, R. N84-32235
BROUSE, J. A., JR. N84-31484
BROUSSARD, J. R. N84-31217
N84-31218
BROUWER, A. E. N84-32029
N84-32031
BROWN, G. A. N84-32265
BROWN, G. F. N84-31760
BROWN, H. N84-32145
BROWN, L. L. N84-31333
BROWN, O. N84-31609
BROWN, P. H. L. N84-32233
BROWN, R. N84-31255
BROWN, R. F. N84-31914
BROWN, R. L. N84-31690
BRUBAKER, D. I. N84-32114
BRUNDERMAN, J. N84-32227
N84-32235
BRUNNMANN, U. N84-31610
BUCK, O. N84-31712
BUCKINGHAM, A. C. N84-31355
BUCKLEY, D. H. N84-31349
N84-31379
BUDKIN, L. A. N84-32070
BUETTNER, H. M. N84-31500
BULAKH, G. I. N84-31449
BULANOV, S. V. N84-32073
BULBOACA, M. A. N84-31258
BULUYEV, A. B. N84-31930
BUNNS, P. G. N84-31067
BURAVTSOV, V. I. N84-31923
BURDICK, R. B. N84-31223
BURLAK, G. N. N84-32045
BURMASOV, V. S. N84-32104
BURMESTER, H. G. N84-31418
BURMESTER, H. J. N84-31418
BURNS, J. R. N84-31155
BURNS, M. A. N84-31468
BUROV, A. A. N84-32109
BURRELL, K. H. N84-32186
BUSH, J. R., JR. N84-31511
BUSKIRK, F. R. N84-32135
N84-32136
BUSSE, C. A. N84-31582
BUTLER, T. R. N84-31199
BUVAYLO, L. Y. N84-32046
BYLINA, N. N84-31705

C

CABAYAN, H. S. N84-31486
CAGLIO, N. N84-31628
CAIRNS, E. J. N84-31525
CALEY, L. E. N84-31295
CALLAHAN, E. N84-32256
CALLAHAN, J. D. N84-32330
CAMMARATA, S. N84-31106
CAMPBELL, C. T. N84-32215
CANFIELD, D. N84-31334
CANTRELL, W. E. N84-31189
CAPELLE, G. A. N84-31624
CARAN, S. C. N84-31858
CARDENUTO, M. C. N84-31106
CAREL, C. N84-31503
N84-31504
CAREY, R. P. N84-31115
CARIGNAN, F. J. N84-31395
CARLEY, J. F. N84-31295
CARLIN, F. H. N84-31934
CARLOS, W. E. N84-32211
CARNE, T. G. N84-31715
CARNIGLIA, C. K. N84-31388
CARPENTER, L. D. N84-32291
CARR, L. W. N84-31554
CARREGA, M. N84-31386
CARRILLO, S. N84-31480
CARROLL, T. J. N84-32326
CARTER, J. G. N84-31536
CARUSO, J. J. N84-31266
CASPERSON, J. N84-32231
CASTLETON, R. N. N84-31952
CATTO, P. J. N84-32189
CEBALLOS, D. C. N84-31996
CEBECI, T. N84-31554
CEGLIO, N. N84-31627
CHAFFIN, R. J. N84-31529
CHAIBLAINE, Z. N84-31722
CHAIYAPHUNT, S. N84-31794
CHALLENER, W. A. N84-32173
CHAMBERLAIN, G. E. N84-32179
CHAMBERLIN, J. L. N84-31538
CHAMBERS, R. M. N84-31492
CHAMIS, C. C. N84-31699
CHAMOROVSKIY, Y. K. N84-32100
CHAN, T. F. N84-32017
CHANDLER, R. F. N84-31939
N84-31948
CHANG, C. P. N84-31873
CHANG, J. N84-32175
CHANG, T. Y. N84-31692
CHAO, S. N84-32168
CHAO, W. C. N84-31691
CHAPELLE, F. H. N84-31728
CHAPLIN, H. R. N84-31100
CHARUKHCHEV, A. V. N84-31452
CHASE, R. P. N84-32186
CHAUDOUET, A. N84-31717
CHEBURKIN, N. V. N84-32065
CHEKALIN, S. V. N84-31236
CHEN, C. N84-31871
CHEN, C. H. N84-31320
CHEN, J. H. N84-31242
CHEN, L. H. N84-31341
CHEN, N. C. J. N84-32219
CHEN, S. C. N84-31623
CHEN, W. H. N84-31703
CHENEVERT, T. L. N84-32113
CHERNOV, V. H. N84-31452
CHEUNG, M. M. N84-32071
CHIAN, A. C. L. N84-31618
CHIANG, S. N84-31327
CHIARELLO, M. G. N84-31964
CHICHKOVA, L. K. N84-32273
CHINTZ, W. N84-31281
CHINO, J. J. N84-31601
CHOW, S. M. N84-31458
CHRISTOPHER, P. A. T. N84-31555
CHRISTOPHOROU, L. G. N84-31536
CHUNG, P. C. K. N84-31342
CLAPP, R. E. N84-31479
CLARK, J. C. N84-32240
CLARK, W. N84-31522
CLARKE, J. F. N84-31302
CLENDENIN, J. E. N84-32161
CLERC, R. N84-31505
N84-31507
CLEVENSON, S. A. N84-31226
CLIFFORD, J. E. N84-31540
CLIFFORD, T. N84-32145
CLINE, T. L. N84-32337
COE, R. J. N84-31476
COLE, J. E., III N84-32119
COLE, T. N84-31522
COLIN, R. N84-31588
COLLIER, R. W. N84-31989
COLLINS, C. I. N84-31642
COLLINS, J. O. N84-31285
COLLINS, L. A. N84-32139
CONKIN, J. N84-31935
CONLEY, J. H. N84-31642
CONN, R. W. N84-32198
CONNELL, C. M. N84-31130
CONNELL, J. R. N84-31875
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N84-31461
CONSTANT, R. N. N84-31158
CONVERT, F. N84-31609
CONWAY, M. N84-31962
COOK, N. E., JR. N84-31666
COOK, P. A. N84-32261
COOK, R. C. N84-31394
COOK, R. D. N84-32014
COOPER, L. N. N84-31938
COOPER, R. H., JR. N84-32166
CORBETT, E. J. N84-31819
CORDILL, C. A. N84-31605
COREY, R. G. N84-31363
COSENTINO, M. J. N84-31746
N84-31747
COSMAN, M. A. N84-32236
COSTELLO, D. J., JR. N84-31992
COTTON, W. R. N84-31871
COURANZ, R. N84-31139
COURTRIGHT, E. L. N84-31389
COWAN, R. N84-31533
COWPERTHWAITE, N. A. N84-31557
COX, P. M. N84-31114
CRISTESCU N84-31982
CROCHET, M. N84-31501
CROSS, J. K. N84-31162
CROSWELL, W. F. N84-31462
N84-31463
CROW, J. T. C. N84-31509
CRUM, L. A. N84-32170
CUMMINGS, R. N84-31477
CUNY, J. N84-31296
CURRY, R. E. N84-31219
CURTAIN, R. F. N84-32002
CURTIN, T. N84-31899
CYRUS, J. D. N84-31787

D

DACUNHA, R. P. N84-31845
DAHLGREN, S. D. N84-31389
DALY, T. A. N84-31682
DAMPIER, F. N84-31522
DANES, Z. F. N84-31856
DANILOV, V. A. N84-32099
DANILYCHEV, V. A. N84-32065
DARBIN, S. D. N84-32071
DARBY, J. B., JR. N84-31790
DASKO, A. D. N84-32067
DASO, E. O. N84-31068
DAVIES, P. B. N84-32134
DAVIS, C. G. N84-32322
DAVISTER, M. D. N84-31667
DAWKINS, W. P. N84-31974
DAWSON, L. R. N84-32208
N84-32209
DAY, G. W. N84-32179
DEBARROSAQUIRRE, J. L. N84-31738
DEBELLIS, D. E. N84-31585
DEBIEZ N84-31375
DEBOO, J. C. N84-32186
DEBRITO, J. I. B. N84-31868
DECASTRO, J. J. B. N84-31517
DEHMER, J. L. N84-31303
N84-32133
DEHMER, P. M. N84-31303
DEJONG, J. N84-31805
DEMAIO, J. N84-32227
N84-32235
DENEZZA, R. E. N84-32259
DENISON, H. C. N84-31157
DENISYUK, Y. N. N84-32068
DENN, M. M. N84-31584
DEPAULA, A. R., JR. N84-31271
DEPAULA, E. R. N84-31839
N84-31843
DEPAULAPEREIRA, S. N84-31738
DERENDYAYEV, N. V. N84-32054
DEROCHER, W. L., JR. N84-31258
DERUGGIERO, A. N84-31134
DESACHY, M. J. N84-31758
DESAI, U. N84-32337

DESAUSSURE, G. N84-31647
DESCHAMBAULT, R. L. N84-31562
DESMERGER, M. N84-31256
DESOUZA, A. C. R. N84-31843
DESOUZA, J. A. M. F. N84-31995
DETINICH, V. A. N84-32100
DEVAN, J. H. N84-31362
DEVIMEUX, J. P. N84-31422
N84-31423
DEVINE, T. E. N84-31124
DEYOUNG, R. J. N84-31617
DIBELLA, F. A. N84-32306
DICKINSON, D. A. N84-31567
DICKINSON, J. T. N84-31291
DICKINSON, T. W. N84-31784
DIDION, D. N84-31426
DIENES, J. K. N84-31710
DIETRICHS, H. J. N84-31212
DIETZ, W. B. N84-31136
DILLES, J. H. N84-31628
DILLINGHAM, T. W. N84-32247
DIMARINO, A. N84-31142
DIMOV, G. I. N84-32158
DINANNO, L. R. N84-32306
DINI, J. W. N84-31358
DINI, J. W., W.C. N84-31390
DOE, D. D. N84-31194
DOERFLINGER, D. N84-31859
DOKTOR, M. F. N84-31273
DOKUCHAYEV, V. G. N84-32069
DOLGOV-SAVELYEV, G. G. N84-32103
DONIN, V. I. N84-32095
DONNET, G. N84-31506
DOOLEY, R. N84-31533
DOWNEY, A. N. N84-31461
DRAGANOV, V. M. N84-31438
DRIGGANS, R. L. N84-31541
DROTNING, W. D. N84-31709
DROUILLARD, T. F. N84-31296
DUBAYAH, R. N84-31743
DUBE, W. N84-32234
DUBOIS, M. N84-31719
DUBOVIK, V. Y. N84-32273
DUMAS, N. S. N84-31495
DUNCAN, L. D. N84-32296
DUNN, B. N84-31382
N84-31621
DUPUIS, L. R. N84-31803
DURAND, A. N84-31683
DURIEUX, J. L. N84-31252
DUTRA, S. L. G. N84-31843
DUTTA, S. N84-31619
DUXBURY, T. C. N84-32330
DVORACK, M. A. N84-31338
DYER, D. N84-31967

E

EARHART, L. N84-31149
EAST, D. J. N84-31251
EASTERLING, R. G. N84-31658
EASTMAN, G. Y. N84-31520
EBARA, K. N84-32041
EBEL, J. N84-31774
EDELMAN, R. B. N84-31277
EDELSHTEYN, V. M. N84-32083
EDGAR, D. N84-31774
N84-31775
EFENDIYEV, T. S. N84-32067
EFFA, P. K. N84-31523
EGAN, L. G., JR. N84-31179
EHRENFRIED, D. H. N84-31127
EIZENBERG, M. N84-31519
EJIMA, S. N84-32186
ELBER, W. N84-31686
ELDER, M. G. N84-31561
ELIA, J. N84-31518
ELMORE, V. L. N84-31145
ELYAFI N84-31982
EMRATH, P. A. N84-32277
ENGLAND, G. R. N84-31171
ERIKSSON, S. L. N84-32027
ERNST, W. N84-32305
ESCALUP, V. N84-31422
ESKRIDGE, R. E. N84-31101
ESMAILI, E. N84-31625
ESTES, J. E. N84-31739
N84-31741
N84-31744
N84-31746
N84-31747
N84-31748
ESTES, R. H. N84-31733
EVANS, B. R. N84-31126
EVANS, M. W. N84-31196
N84-31197
EVANS, W. D. N84-32337
EVERTSE, J. H. N84-32019
EYDELAND, A. N84-32009

F

FAGOT, M. C. N84-31851
FAIGEN, I. M. N84-31464
FAINTICH, M. B. N84-31767
FAIRBANKS, E. S. N84-32186
FAIRCHILD, P. W. N84-31329
FARMER, R. E. N84-31192
FARRINGTON, G. N84-31382
FARRINGTON, G. C. N84-31621
FEDIRKO, V. A. N84-32053
FEDOSEYEV, A. I. N84-32084
FEERICK, B. N84-32143
FENDELL, F. N84-31307
FENDELL, F. E. N84-31329
FENG, W. W. N84-31393
FERREIRA, D. L. N84-31245
FERREIRA, L. D. D. N84-31246
FERRELL, W. R. N84-31630
FERRON, A. N84-31653
FERTIG, D. G. N84-31698
FGEPPERT, E. N84-31644
FIACCO, A. V. N84-32267
FILHO, A. D. M. N84-31870
FILHO, V. D. S. N84-31870
FILTER, W. N84-32175
FINNEMORE, D. K. N84-32212
FISCH, G. N84-31869
N84-31870
FISCHER, T. A. N84-32208
FISCHER, W. C. N84-31686
FISHER, D. M. N84-31348
FISHMAN, G. S. N84-32015
FITZPATRICK, J. J. N84-31391
FLACK, R. D. N84-31680
FLAIM, T. N84-31796
FLAVENOT, J. F. N84-31720
FLEETER, R. D. N84-31329
FLEISS, J. N84-31123
FLEMING, R. C. N84-31156
FLORES, C., JR. N84-31112
FLORES, J. N84-31094
FLOWER, M. N84-31774
FLURKEY, A. J. N84-31829
FLYNN, K. F. N84-32165
FLYNN, T. N84-31770
FOLEY, D. N84-31769
FOLLIN, J. W. N84-31490
FOMICHEVA, O. F. N84-32052
FOMIN, S. G. N84-31337
FONTANA, T. N84-31472
FORD, D. G. N84-31115
FORD, T. S. N84-31295
FORDYCE, J. S. N84-31272
FORTIN, M. N84-32225
FOSDICK, R. E. N84-31157
FRANCIS, G. L. N84-32189
FRANK, C. F., JR. N84-31154
FRANKE, R. N84-32020
FRANKLIN, J. N84-31741
FRANKS, L. A. N84-31624
FRANKS, R. N84-31483
FRANZEN, D. L. N84-32179
FREEDMAN, H. T. N84-32251
FREEMAN, J. R. N84-32144
FREMIOT N84-31662
FRENZL, O. N84-31610
FRESE, K. W., JR. N84-31334
FREY, P. R. N84-31219
FRIEDMAN, K. N84-32308
FRIEDMAN, P. N84-31216
FRIEDMAN, S. H. N84-31143
FRODIGH, R. J. N84-31768
FROES, F. H. N84-31352
FROLOV, O. P. N84-31432
FROMME, D. A. N84-31268
FRY, M. A. N84-31567
FU, K. C. N84-31685
FUJIMOTO, A. N84-32040
FUKAMI, Y. N84-32041
FUKUZAWA, F. N84-32182
FULLER, C. R. N84-32123
FUM, J. S. N84-31110
FURTEK, F. C. N84-31957

G

GABASOV, R. N84-32078
GABRIEL, W. N84-31859
GAINES, L. L. N84-31414
GALINDO-ISRAEL, V. N84-31485
GALLAWA, R. L. N84-32179
GAMBLE, W. W. N84-32290
GAMNON, C. N84-31125
GAO, Z. N84-31564
GARBER, F. D. N84-31458
GARBER, R. N84-32295
GARBER, S. C. N84-31959
GARCIA, E. M. N84-31158
GARDNER, J. A. N84-32251
GARLICK, R. G. N84-31345
GAROUTTE, K. F. N84-31542
GARRELICK, J. M. N84-32119
GARRETT, W. R. N84-31630
GASH, J. H. C. N84-31869
N84-31870
GAYDUKOV, Y. P. N84-32082
GAYLORD, D. R. N84-31830
GELLIN, S. N84-31669
GELMAN, H. N84-31480
GELTSEL, M. Y. N84-31908
GERMAN, A. M. N84-32101
GESHEV, P. I. N84-32092
GEYER, D. W. N84-31172
GEYER, M. A. N84-31156
GHIGLIONE, D. N84-31374
GHOMEM, N. M. N84-32196
GHUSN, G., JR. N84-31770
GIARLA, W. N84-31108
GIFFIN, W. C. N84-31945
GILL, W. M. N84-31191
GILLIA, M. N84-31760
GIORDANO, S. N84-32145
GLAZMAN, Y. S. N84-31433
GLEBOV, L. S. N84-32069
GLENN, D. P. N84-32251
GLOTOV, Y. P. N84-32065
GLYNN, P. N84-32268
GOATES, S. R. N84-31312
GOEDTKE, P. N84-31269
GOEKOGLU, S. A. N84-31558
GOLD, B. N84-32127
GOLDBERG, B. E. N84-31378
GOLDBERG, I. S. N84-31306
GOLDIEZ, B. F. N84-32247
GOLDMAN, A. N84-31114
N84-31293
GOLDMAN, L. M. N84-32190
GOLDSBY, D. N84-32266
GOLDSTEIN, M. L. N84-32333
GOLUBINSKIY, A. I. N84-32062
GOLUBJATNIKOV, O. N84-31186
GOLUBKIN, V. N. N84-32062
GONCHARSKIY, A. V. N84-32099
GONDET, J. F. N84-31250
GONZALEZ, C. W. N84-31179
GOODMAN, H. M. N84-31866
GOODWIN, R. W. N84-32140
GOORJIAN, P. M. N84-31092
GOPALAKRISHNAN, S. N84-31877
GOREE, P. F. N84-31211
GORKOV, V. N84-31231
GORSHKOV, A. S. N84-32086
GOTO, N. N84-31882
GOTTLIEB, J. J. N84-31563
GOUDEY, D. A. N84-31457
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GRANT, J. N84-32282
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GREENSPAN, H. P. N84-31573
GREGOIRE, H. N84-31722
GREGORY, J. C. N84-31596
GREGORY, J. G. N84-31156
GREIMER, R. W. N84-31805
GRESHO, P. M. N84-31571
GRIDER, K. V. N84-31254
GRIDIN, L. A. N84-31931
GRIFFIN, E. L. N84-31166
GRIGOREV, A. K. N84-31337
GRIGORYANTS, V. V. N84-32100
GRISHIN, S. D. N84-31236
GROH, K. N84-31269
GROSS, K. P. N84-32131
GUEZ, A. N84-31543
GUILLARD, R. N84-31654
GUNKLER, T. A. N84-32335
GUNTHER, F. J. N84-31749
N84-31754
GUREVICH, I. G. N84-32076
GUREVICH, R. V. N84-31433
GUREVICH, Y. G. N84-32065
GUREVICH, Y. R. N84-31433
GURUSWAMY, G. P. N84-31092
GUSTAFSON, G. N84-31594
N84-31596

GUTTMAN, I. N84-32005
GWATKING, J. C. N84-31969

H

HAACK, G. R. N84-31469
HACK, J. E. N84-31294
HADLEY, A. T., III N84-31935
HAGELSTEIN, P. N84-31627
HALICIOGLU, M. T. N84-31682
HALL, L. N84-32301
HALLINAN, E. J. N84-32294
HALLQUIST, J. O. N84-31079
HALYO, N. N84-31217
N84-31218
HAMEL, W. R. N84-31647
HAMILTON, B. N84-31946
HAMILTON, D. J. N84-31533
HAMILTON, P. N84-31899
HAMMACK, J. N84-31901
HAMMEL, J. E. N84-32166
HAMROCK, B. J. N84-31640
HAMSTAD, M. A. N84-31296
HAN, K. S. N84-31616
HAND, G. R. N84-31978
HANNAMAN, D. L. N84-31492
HANNAN, P. W. N84-31467
HANSEN, G. M. N84-32170
HANSEN, H. N84-31117
HANSON, C. L. N84-32349
N84-32261
HANSON, R. E. N84-31631
HAPPEL, H. W. N84-31212
HARADA, Y. N84-31304
HARB, A. N84-31685
HARDIN, D. P. N84-31482
HARDISON, D. R., JR. N84-32172
HARDY, G. N84-31105
HARLING, O. K. N84-31359
HARRINGTON, R. F. N84-31491
N84-31493
HARRIS, J. M. N84-31883
HARRISON, D. C. N84-31936
HARRISON, P. M. N84-31638
HARRISON, W. N84-31774
N84-31775
HARSHA, P. T. N84-31277
HART, T. T. N84-31398
HARTEL, C. R. N84-31247
HARTFORD, A., JR. N84-31405
HARUYAMA, Y. N84-32162
HAUCK, D. N84-32226
HAUPT, R. L. N84-31481
HAVILAND, J. K. N84-31267
HAWKS, K. B. N84-31168
HAYES, J. M. N84-31316
HEADRICK, A. K. N84-31313
HECHT, H. N84-31955
HECHT, M. N84-31956
HECHT, R. J. N84-31363
HEIDEMANN, K. N84-31289
N84-32201
HEINO, K. N84-31212
HEINS, V. N84-31316
HELD, M. N84-31257
HEMMINGS, D. L. N84-31643
HEMDEWERK, M. N84-31325
HENDRICKS, P. L. N84-32289
N84-32290
HENDRICKSON, C. P. N84-31951
HEINTSCHKE, E. U. N84-31612
HEPPNER, R. A. N84-31604
HERRING, C. E., JR. N84-31971
N84-31972
HERSCHBACK, D. R. N84-32163
HESS, H. D. N84-31611
HEYDORN, R. P. N84-31762
HEYMSFIELD, A. J. N84-31891
HEYNICK, L. N. N84-31912
HIGDON, H. S. N84-31617
HILAIRE, G. N84-31116
HILLMAN, D. N84-31634
N84-31636
N84-31637
HILT, D. E. N84-31194
HINDMAN, E. E. N84-31671
HINSON, D. P. N84-32331
HINZE, W. N84-31775
HITT, E. F. N84-31176
HJELMFELT, M. R. N84-31691
HOCK, S. N84-31796
HOELLIG, K. N84-32006
HOESSLER, S. N84-31422
HOFFMAN, E. E. N84-32166
HOFFMAN, M. D. N84-31950
HOFSTADTER, D. R. N84-31990
HOGAN, B. M. N84-32174
HOLCOMBE, G. N84-31946
HOLDEMAN, J. D. N84-31985
HOLLENBACH, D. J. N84-32328
HOLST, T. N84-31094
HOMA, J. M. N84-31274
HOMMA, T. N84-32041
HONG, J. N84-31417
HOOG, T. W. N84-32244
HOOGENBOOM, L. N84-31589
HOPKINS, D. A. N84-31699
HOPKINS, T. S. N84-31898
HORRIGAN, D. J., JR. N84-31936
HORTON, D. G. N84-31832
HORTON, J. A. N84-31625
HOSKING, F. M. N84-31384
HOUSER, M. J. N84-31595
HOUTZ, M. D. N84-31600
HOWELL, W. C. N84-31941
HOWES, W. L. N84-32169
HSI, S. W. N84-31491
HSU, D. S. Y. N84-31401
HSU, M. T. S. N84-31284
HUBBARD, H. H. N84-32120
HUDDLESTUN, P. F. N84-31833
HUDSON, E. D. N84-32151
HUFF, L. A. N84-31518
HUFF, R. G. N84-32122
HUGHES, T. J. R. N84-31694
HULL-ALLEN, G. N84-31599
HULL, J. R. N84-31793
HUNTER, S. R. N84-31536
HUNTLEY, W. R. N84-31586
HUO, W. M. N84-32131
HURLEY, K. N84-32337
HURST, G. S. N84-31319
HUSEYIN, K. N84-31681
HUSMANN, O. K. N84-31269
HUSON, G. G. N84-31099
HUSSAR, J. S. N84-32230
HWANG, I. H. N84-31616
HWANG, L. S. N84-31901

I

ICHIKAWA, Y. N84-32036
IGNATOV, V. Y. N84-31445
ILES, M. K. N84-31793
ILLINGWORTH, A. J. N84-31848
INGELS, F. M. N84-31958
INUZUKA, K. N84-32040
IONOV, A. V. N84-32046
IRANMEJAD, B. N84-31635
ISHIYAMA, H. N84-32035
ISMAGILOV, S. G. N84-31444
ISMAILOV, T. N84-31238
ISOBE, N. N84-32035
ISUPOV, G. P. N84-32056
IVANCIC, W. A. N84-31333
IVANOV, A. A. N84-32105
IVANOV, G. N84-31120
IVANOVA, A. V. N84-32087
IWAN, D. C. N84-32144
IYER, N. C. N84-31684
IZYNEYEV, A. A. N84-32100

J

JACAVANCO, D. J. N84-31481
JAMROS, R. K. N84-31949
JANSEN, M. N84-31621
JASPERSON, W. H. N84-31865
JEFFREY, A. M. N84-31316
JENSEN, J. E. N84-32205
JERGER, S. N84-31518
JESSUP, D. A. N84-31624
JETT, M. D. N84-31417
JIA, R. Q. N84-32004
JOBE, R. K. N84-32161
JOHANSON, E. W. N84-31603
JOHNSON, E. R. N84-31735
JOHNSON, H. H. N84-31360
JOHNSON, J. A. N84-31657
N84-31714
JOHNSON, K. R. N84-31834
JOHNSON, M. C. N84-31601
JOHNSON, W. N84-31090
JONAH, C. D. N84-31324
JONAS, J. N84-32231
JONES, J. R. N84-31482
JONES, K. N. N84-31705
JONES, L. A. N84-32199
JONES, R. N84-31293
JONKERS, H. S. M. N84-31980
JORDON, S. A. N84-32291
JORGENSEN, W. F. N84-32233
JOSEPH, D. D. N84-31565
N84-31568
JUNG, E. N84-31633
JUNGER, M. C. N84-32119
JURANEK, H. J. N84-32178
JUSTAS, A. L. N84-32165

K

KABLEC, E. G. N84-31787
KACZMAREK, B. N84-31423
N84-31425
KAILATH, T. N84-31486
KALINSKI, J. R. N84-31611
KALIOKOSKI, J. N84-31778
KAMCHI, J. S. N84-32234
KAMENEV, Y. Y. N84-32066
KAMO, R. N84-31641
KANEDA, T. N84-32036
KANG, D. N84-31690
KANIA, D. R. N84-32199
KANTOR, I. J. N84-31843
KANYON, S. J. N84-32325
KAPINOS, V. M. N84-32064
KAPLAN, J. D. N84-31247
KAPPEL, F. N84-32010
KAPSHTAL, G. G. N84-32052
KARKER, Y. I. N84-31237
KARUBE, K. N84-32035
KASATOV, A. P. N84-31933
KASIMOV, A. M. N84-32056
KASSEN, D. N84-31612
KASZA, K. E. N84-31579
KATES, R. N84-31936
KAUFFMAN, R. N84-31627
KAUFFMAN, R. L. N84-31628
KAUFMAN, M. J. N84-31361
KAUN, T. D. N84-31544
KAZANAS, D. N84-32338
KAZANSKIY, V. B. N84-31442
KEAN, E. S. N84-31196
KEDDY, E. S. N84-31561
KELKAR, A. N84-31686
KELLER, A. S. N84-31541
KELLER, D. J. N84-32137
KELLEY, W. K. N84-31360
KELLY, L. G. N84-31300
KERIMOV, O. M. N84-32066
KERKAR, S. P. N84-31941
KERWIN, W. N84-31533
KETTERSON, J. B. N84-31531
KEUNINGS, R. N84-31584
KHALIFA, H. E. N84-32307
KHAN, A. S. N84-31363
KHANDOV, M. Z. N84-31927
KHARITON, Y. N84-32063
KHAYRULLIN, I. K. N84-31444
KHIARI, F. N84-32145
KHUKHLAYEV, V. K. N84-31919
KIDD, P. D. N84-31193
KIDWELL, J. R. N84-31169
KIELB, R. E. N84-31683
KIERNAN, J. M. N84-31808
KIM, C. N84-32136
KINOSHITA, K. N84-31535
KIRCHHOFF, V. W. J. H. N84-31844
KIRCHOFF, M. N84-31128
KIRILLOVA, F. M. N84-32078
KIRKPATRICK, D. N84-31780
KLEHR, J. T. N84-32258
KLEIN, S. N84-31426
KLEVGARD, P. A. N84-31606
KLEYMENOV, V. Y. N84-31351
KLIMACH, H. W. N84-31490
KLIMAS, P. C. N84-31787
KNIGHT, J. C. N84-31954
KNIGHTLY, G. H. N84-31559
KNOOP, P. A. N84-31126
KNYAZ, A. I. N84-31438
KOBAYASHI, R. N84-31417
KOBAYASHI, Y. N84-32041
KOCH, K. R. N84-31661
KODRYANSKIY, V. M. N84-31447
KOGAN, V. G. N84-32212
KOGGE, P. M. N84-31166
KOHL, F. J. N84-31558
KOHSE, G. N84-31359
KOKIN, A. A. N84-31453
KOLANDER, W. N84-31117
KOLODYNSKA, V. V. N84-31911
KOLODYNSKIY, A. A. N84-31911
KONAPELSKY, R. S. N84-31471

KONKOV, N. N84-31231
KONONENKO, A. G. N84-31447
KONRAD, G. T. N84-31527
KONSTANTINOV, S. G. N84-32194
N84-32195
KOONEN, J. A. G. M. N84-31967
KOPACHEVSKIY, N. D. N84-32058
KOPETZ, H. N84-31986
KOPLOW, M. D. N84-32306
KOPYSTYANSKAYA, K. R. N84-31920
KORNEV, A. V. N84-31906
KORNEYEV, N. I. N84-31351
KOROSEC, M. A. N84-31771
KOSICHKIN, Y. V. N84-32097
KOSOBUD, R. F. N84-31882
KOSTYUCHENKO, A. L. N84-31923
KOSTYUKOVA, O. I. N84-32078
KOTANI, M. N84-32037
KOTOV, A. I. N84-32089
KOUROUPIS, J. N84-31601
KOVALSKAYA, G. A. N84-32106
KOYDAN, V. S. N84-32104
KOZLOV, V. A. N84-31440
KOZLOV, V. V. N84-32055
KRASHTERKA, M. N84-31435
KRASILSHCHIKOV, S. N. N84-32076
KRAVCHENKO, V. B. N84-32100
KREMER, I. Y. N84-32101
KRISHNAN, P. N. N84-32172
KRIZHANOVSKIY, V. I. N84-31443
KRUGEL, A. M. N84-32090
KRUSE, V. J. N84-31783
KRUTSENKO, I. V. N84-32050
KUBAN, D. P. N84-31646
KUCERA, G. H. N84-31539
KUDELKIN, S. A. N84-31932
KUDRNA, K. N84-31477
KUDRYAVTSEV, A. M. N84-32194
N84-32195
KUECHER, G. N84-31774
KUGA, H. K. N84-31106
KULAKOVSKIY, V. D. N84-32063
KULCHITSKIY, V. L. N84-32051
KULESHOV, Y. M. N84-32096
KUMAR, M. N84-31764
KUNERTH, D. C. N84-31649
KUNG, H. H. N84-31308
KUNZE, G. N84-31370
KURCHATOV, I. V. N84-32200
KURGUZOV, S. N84-31927
KURZIUS, S. C. N84-31273
KUSUOKA, S. N84-32032
KUTLER, P. N84-31089
N84-31093
KUZAY, T. M. N84-31579
KUZELEV, M. V. N84-32074
KUZMENKO, V. A. N84-31930
KUZMICHEV, A. I. N84-31443
KUZMIN, G. A. N84-32091

L

LABELLE, S. J. N84-32308
LACASSE, M. G. N84-32324
LACHENBRUCH, A. H. N84-31854
LACKNER, A. M. N84-32205
N84-32206
N84-32207
LAIRD, A. R. N84-31306
LAIRD, C. E. N84-31763
LAKDAWALA, V. K. N84-31536
LAM, N. Q. N84-32214
LAMBERT, C. N84-32162
LAMSHEV, L. M. N84-32048
LANCASTER, R. W. N84-31897
LANE, J. H. N84-31153
LANE, L. J. N84-31776
LANG, H. N84-31859
LANG, P. H. N84-31129
LANGEL, R. A. N84-31733
LANIER, J. R., JR. N84-31511
LAPRUN, I. B. N84-31922
LAROCHE, M. A. N84-31371
LARSEN, D. C. N84-31210
LASUKOV, V. V. N84-32084
LATHAM, R. N84-32226
LAU, H. N84-32301
LAU, K. M. N84-31873
LAUTNER, D. E. N84-31131
N84-31132
LAVROSVKIY, L. A. N84-32066
LAWRENCE, C. N84-31683
LAWSON, M. O. N84-31795
LAXPATI, S. R. N84-31468
LEAF, G. K. N84-31577
LEAVY, W. P. N84-32225
LEBEDENKO, A. N. N84-32096
LEE, C. S. N84-31820
LEE, J. J. N84-31821
LEE, M. L. N84-31312
LEE, R. N84-31627
LEE, R. W. N84-31552
LEE, S. H. N84-31551
LEE, T. N84-31899
LEE, T. D. N84-32153
LEE, X. S. N84-32189
LEESE, G. E. N84-31667
LEGECKIS, R. N84-31900
LEGRAND, F. N84-31282
LEGUILLOU, Y. N84-31506
LEIB, J. E. N84-31144
LEIDICH, C. A. N84-32318
LEIGH, R. W. N84-31409
LEIPELT, G. N84-31627
LEISENBERG, W. N84-31611
LEITE, J. P. N84-32181
LEONARD, J. A. N84-31792
LEONE, J. M., JR. N84-31571
LESHT, B. M. N84-31804
LETALLEC, P. N84-31566
LEUNG, K. C. N84-31731
N84-31751
N84-31752
N84-31753
LEVERANT, G. R. N84-31294
LEVIT, I. N84-31694
LEWANDOWSKI, F. N84-32243
LEWIS, M. L. N84-31475
LIBBRECHT, K. G. N84-32334
LIBURDY, R. P. N84-31913
LIEBLEIN, E. N84-31135
LIGHTFOOT, F. M. N84-31167
LIKHACHEVA, O. A. N84-31919
LIN, J. T. N84-31880
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LIN, S. N84-31992
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LIPFERT, F. W. N84-31803
LIPSCOMB, G. G. N84-31584
LIPTON, R. J. N84-31521
LLOYD, C. R. N84-31869
N84-31870
LOBITZ, D. W. N84-31713
LOCKWOOD, G. N84-32175
LOEVE, W. N84-31984
LOFBERG, M. S. N84-31939
LOGGINOV, A. S. N84-31451
LOMANOV, G. N84-31234
LOMBARDI, A. N84-31522
LONARDO, G. N84-31139
LONDEN, S. O. N84-31999
LONGO, T. A. N84-31152
LONSKIY, E. S. N84-31446
LOPES, R. V. D. N84-31997
LORD, R. N84-31866
LORD, R. S. N84-32151
LORTON, L. N84-31381
LOT, L. A. N84-31657
LOTT, L. A. N84-31649
LOWELL, C. E. N84-31345
LOWERY, H. N84-31128
LU, J. N84-31720
LU, L. N84-31384
LUBOFSKY, M. N84-31158
LUKHACHEV, O. A. N84-32091
LUTH, V. G. N84-32161
LUTZ, M. N84-31614
LYASHEDKO, L. G. N84-32086
LYASNIKOV, Y. P. N84-31436
LYNN, D. K. N84-31533
LYON, P. N84-32224
LYSENKO, W. P. N84-31499

M

MACGREGOR, W. I. N84-31950
MACHIN, A. S. N84-31704
MACK, M. A. N84-32127
MACKELPRANG, C. E. N84-31853
MACKLIN, S. A. N84-31890
MADSEN, D. J. N84-31496
MAEDER, P. F. N84-31587
MAFFETT, A. L. N84-31490
MAGEE, J. W. N84-31417
MAKARENKO, A. A. N84-31448
MALEK, A. N84-31588
N84-31589
MALLORY, M. L. N84-32151
MALONE, G. A. N84-31350
MALYSH, M. M. N84-32065
MANN, L. J. N84-31749
N84-31747
MARACHEV, A. G. N84-31908
MARCIANO, W. J. N84-32159
MARCUCCI, P. J. N84-31409
N84-31404
MARCUS, A. N84-31247
MARGARYAN, A. A. N84-31788
MARGERUM, J. D. N84-32205
N84-32208
N84-32207
MARKHAM, B. L. N84-31734
N84-31755
N84-31756
MARKMAN, V. G. N84-31927
MARLIN, J. N84-32242
MARQUES, A. D., FILHO N84-31869
MARR, W. W. N84-31545
MARROQUIN, J. N84-31260
N84-31261
MARRUCCI, G. N84-31584
MARSCH, D. N84-31611
MARSHALL, B. A. N84-31260
N84-31261
MARSHALL, J. B. N84-32278
MARSHALL, N. N84-31614
MARSHALL, S. V. N84-31914
MARSHALL, T. C. N84-31623
MARTIN, C. N84-31973
MARTIN, E. N84-32243
MARTIN, H. L. N84-31908
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MARTIN, R. F., JR. N84-31809
MARTINEZ, D. R. N84-31715
MARTINEZ, R. N84-32119
MARTINI, D. N84-31614
MARTINS, R. C. D. O. N84-31271
MARYANOVICH, A. T. N84-31931
MARYENKO, B. S. N84-31920
MAS, C. N84-31332
MASCHKE, A. W. N84-32157
MASHKEVICH, O. L. N84-32085
MASUDA, T. N84-32182
MASYURENKO, Y. A. N84-31447
MATSUMOTO, A. N84-32182
MATSUMOTO, M. N84-32183
MATTHEWS, D. N84-31627
MATTHEWS, D. L. N84-31628
MATTHEWS, E. N84-31761
MAY, C. E. N84-31293
MAYES, C. B. N84-32165
MAYHALL, D. J. N84-31496
MAZING, G. Y. N84-31237
MCANELLY, R. L. N84-31871
MCARTHUR, D. N84-31109
MCCASKILL, G. T. N84-32262
MCCORMICK, D. N84-32243
MCCORMICK, J. B. N84-31533
MCCOY, G. A. N84-31415
MCCURDY, D. A. N84-32124
MCDONALD, J. K. N84-31402
MCGEER, T. N84-31109
MCGHEE, L. A. N84-31215
MCGLADE, M. J. N84-31316
MCGUIRE, E. J. N84-32187
MCKENZIE-WILSON, R. N84-32145
MCKENZIE, R. L. N84-32131
MCKINNEY, P. M. N84-31857
MCKINZIE, D. J., JR. N84-31096
MCLARNON, F. R. N84-31525
MCLEAN, J. D. N84-31215
MCLINDEN, M. N84-31426
MCMASTER, W. H. N84-31578
MCTIGUE, D. F. N84-31574
MCWHORTER, A. L. N84-32204
MEDECKI, H. N84-31627
N84-31628
MEDLIN, C. H. N84-32023
MEHLHORN, T. A. N84-32187
MEHTA, S. N84-31513
MEHTA, U. B. N84-31089
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MEIER, G. E. A. N84-31613
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MERKISHIN, G. V. N84-31429
MERRIGAN, M. A. N84-31581
N84-31583
MERRITT, J. A. N84-31402
METZ, P. D. N84-31409
METZ, P. R. N84-31167
MEURER, B. N84-31299
MEYER, A. N84-31661
MEZZINA, A. N84-31410
N84-31411

MICHAELIS, P. R. N84-31492
MICHENER, J. R. N84-31671
MIDGE, R. N84-31609
MIKHALEVICH, V. S. N84-32080
MILBERT, D. G. N84-31987
MILLER, A. K. N84-31715
MILLER, G. E. N84-31476
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MILLER, J. H. N84-32142
MILLER, R. A. N84-31347
MILLER, R. L. N84-31328
MILLER, S. L. N84-32212
MILLER, W. C. N84-31285
MILLICH, A. N84-32161
MILYUSHENKO, V. A. N84-31904
MINARDI, J. E. N84-31795
MINH, H. Q. N84-31544
MINKOVICH, V. P. N84-32100
MIROLYUBOV, A. V. N84-31909
N84-31929
MITICH, M. J. N84-31512
MITCHAEL, J. L. N84-32263
MITTRA, R. N84-31485
MOLARI, R. N84-31862
MOLION, L. C. B. N84-31870
MONNIER, P. N84-31723
MONOSMITH, W. B. N84-31305
MONTES, A. N84-31517
N84-32181
MOORE, C. J. N84-31869
N84-31870
MOORE, L. R., III N84-32015
MOORE, R. L. N84-31295
MOORE, T. E. N84-31810
MORAN, H. R., JR. N84-31156
MORELAND, J. N84-31518
MORGAN, D. R. N84-31173
MORGENTHALER, S. N84-32012
N84-32021
N84-32022
MORGUN, V. F. N84-32066
MORIARITY, T. M. N84-32255
MORO, J. N84-31243
MOROZKIN, V. P. N84-31450
MORRIS, R. N. N84-32197
MOSS, S. C. N84-31357
MOTALLEBI, N. N84-31896
MOTE, J. D. N84-31391
MOTTA, A. G. N84-31844
MOULIN, P. N84-31661
MOYE, R. L. N84-31462
N84-31463
MRAZEK, F. C. N84-31544
MUCHICK, D. N84-32237
MUGGERIDGE, J. N84-31780
MUKHOPADHYAY, V. N84-31884
MULAC, W. A. N84-31324
MULLER, J. C. N84-32297
MUNUNI, I. A. N84-31668
MURALIKRISHNA, P. N84-31244
N84-31840
N84-31965
MURANOVA, G. A. N84-31439
MURAVITSKIY, M. A. N84-32066
MURAVYEV, A. A. N84-32067
MURFREE, J. A. N84-31403
N84-31404
MURTY, H. S. N84-31563
MYERS, C. R., JR. N84-32238
MYRA, J. R. N84-32189
MYSKIN, O. K. N84-32194
N84-32195

N

NAGLE-EDHLEMAN, J. N84-31676
N84-31679
NAJMABADI, F. N84-32196
NAKAGAWA, R. N84-31780
NAMAZIAN, M. N84-31322
NARAIN, S. N84-31108
NASTROM, G. D. N84-31865
NEDELL, S. N84-31105
NEIGHBOURS, J. R. N84-32135
N84-32136
NEKHAYEV, A. L. N84-31428
NEKLYUDOV, A. A. N84-31441
NELSON, C. A. N84-32148
NEPOSHCHENKO, L. X. N84-32125
N84-32126
NESBITT, J. A. N84-31344
NESTERENKO, V. F. N84-32106
NETO, A. R. N84-31106
N84-31243
N84-31246
N84-31963
NEUMANN-DUSCHA, I. N84-31996
NEWMAN, J. N84-32284
NEWMAN, R. C. N84-31780
NEWSOM, J. R. N84-31367
NEYER, B. N84-31684
NICHOLAS, S. N84-32175
NICHOLS, J. T. N84-31155
NICHOLSON, J. N84-31525
NICOL, M. R. N84-31847
NIEL, M. N84-32244
NIGHTINGALE, N. N84-32337
NIKITIN, N. V. N84-32305
NIKOLAYEVA, I. P. N84-31452
NIKONOROV, N. V. N84-31923
NIKU-LARI, A. N84-32069
NISHIMURA, N. N84-31720
NISHIZAWA, A. N84-31706
NIZHENSKIY, A. D. N84-32182
NOBLET, Y. N84-31447
NOECKER, D. J. N84-31398
NOEL, G. T. N84-31295
NOGUCHI, H. N84-31797
NORDHAUS, W. D. N84-32037
NOVIKOV, V. I. N84-31882
NOWAK, G. N84-31430
NOWLIN, A. N84-32301
NOWOTNY, H. N84-31973
NUMAZIRI, T. N84-31365
NUSSBAUM, P. N84-32037
N84-31594
N84-31596
NUZHNYY, V. A. N84-32060
NWOKOGBA, I. E. N84-32279
NYHART, J. D. N84-31780
NYO, H. L. N84-31493

O

OBAYASHI, C. N84-32039
OBELL, D. R. N84-31158
OBERNDORF, P. A. N84-31161
OBLOW, E. M. N84-31647
OBRIEN, W. J. N84-31381
OCAMPO, A. C. N84-32330
ODEN, J. T. N84-31696
ODORICO, J. N84-31298
OKAMOTO, P. R. N84-32214
OKE, J. B. N84-31781
OKHOTNIKOV, O. G. N84-32070
OLDENBORG, R. C. N84-31405
OLIVEIRA, J. R. D. N84-31245
OLSEN, G. C. N84-31560
OLSEN, J. N. N84-32187
OLSGAARD, J. N. N84-32276
OLSON, A. P. N84-32329
N84-32339
OLSON, R. J. N84-32292
OLSON, S. F. N84-31811
OLSSON, J. N84-31190
OLVER, F. W. J. N84-32016
ORAILOGLU, A. N84-31953
ORISHICH, A. M. N84-32103
ORLANDO, V. N84-31963
ORLANSKY, J. N84-32232
ORRIOLS, M. N84-31422
ORVILLE, R. E. N84-31597
OSBORN, H. B. N84-31776
OSBORNE, T. H. N84-32192
OSBOURN, G. C. N84-31529
N84-32208
OSSWALD, G. A. N84-31549
OSTROVSKIY, I. V. N84-31449
OSTROW, S. J. N84-32316
OTAVINA, L. A. N84-32052
OUCHI, S. N84-31812
OVERSKEI, D. O. N84-32186
OWEN, E. W. N84-31526
N84-31532
N84-31534
OWINGS, J. N84-31949

P

PADDISON, F. C. N84-31490
PADOVAN, J. N84-31693
N84-31696
PAGE, R. A. N84-31294
PAK, G. T. N84-32070
PALMER, M. T. N84-31104
PAN, J. J. N84-31822
PANASYUK, V. M. N84-32194
N84-32195
PANIN, V. A. N84-32074
PARADA, L. E. M. N84-31738
PARADISO, M. A. N84-31938
PARAMONOVA, T. N. N84-32068
PAREEK, P. N. N84-32130
PARKINSON, D. N84-32250
PARR, A. C. N84-32133
PASCHEN, D. A. N84-31474
PASHININ, P. P. N84-32098
PASSENHEIM, B. C. N84-31268
PASSMAN, S. L. N84-31574
PATASHINSKIY, A. Z. N84-32091
PATRICK, M. L. N84-31988
PATTI, P. N84-32242
PA[illegible]KE, K. N84-31370
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PAVLOV, A. S. N84-31926
PAVLOVA, T. A. N84-31925
PAVY, J. C. N84-31659
PAWLEWICZ, W. T. N84-31629
PAXTON, L. J. N84-32332
PAYNE, M. G. N84-31318
N84-31630
PEARCE, H. T. N84-31669
PECK, E. L. N84-31735
PEDERSEN, J. F. N84-31487
PEDERSON, C. O. N84-31970
PEEK, J. M. N84-32187
PELIX, G. N84-32162
PENEAU, J. M. N84-31502
PENTECOST, E. N84-32283
PEON, G. A. N84-31471
PEPE, J. T. N84-31122
PERBOS N84-31758
PEREIRA, J. A. G. N84-31994
PERKINS, D. C. N84-31949
PERKINS, J. R. N84-31131
N84-31132
PERRY, A. M. N84-31879
PERRY, D. N. N84-32311
PERTSEVA, V. A. N84-31428
PERVEYEZ, A. F. N84-31439
PETER, F. E. N84-31147
PETERS, H. N84-31311
PETERSEN, K. L. N84-31112
PETERSEN, W. B. N84-31101
PETERSON, H. L. N84-32210
PETROVSKIY, G. T. N84-32069
PETRUCCI, S. N84-31304
PEUQUET, D. N84-31739
N84-31742
N84-31745
PEYCLIT, D. N84-32162
PFANNKUCH, H. N84-31775
PFEILSTICKER, K. N84-31859
PHERSON, D. N84-31656
PHILLIPS, R. H. N84-31645
PHILLIPS, W. M. N84-31656
PIAN, T. H. H. N84-31690
PICHEL, W. N84-31900
PICKENS, J. R. N84-31352
PIERCE, R. D. N84-31544
PIERINI, S. N84-31591
PIERSON, W. J., JR. N84-31732
PIETRAFESS, L. N84-31899
PIGORS, O. N84-31336
PIKHTELEV, A. I. N84-32070
PIPER, L. B. N84-31400
PISHCHIK, V. N84-31229
N84-31230
PITTMAN, R. B. N84-32318
PITTS, M. N84-31647
PLAKHOTNYY, V. P. N84-32051
PLATONENKO, N. M. N84-32079
POCALYKO, P. N. N84-31175
POLHAMUS, E. C. N84-31097
POLIVANOV, Y. N. N84-32098
POLLOCK, N. N84-31222
POLSON, P. N84-31912
PONCHAK, G. E. N84-31461
PONOMARENKO, A. G. N84-32103
PONOMAREV, Y. N. N84-32047
PONOMAREVA, S. B. N84-32047
PONTIER, P. N84-31991
POPKOV, N. G. N84-32105
POPOV, S. Y. N84-31909
N84-31929
POPOV, V. I. N84-31922
POPOV, V. V. N84-32099
POPOV, Y. V. N84-31447
PORTANOVA, G. N84-31155
PORUBCANSKY, C. A. N84-31121
N84-31165
N84-31201
N84-31202
N84-31203
N84-31204
N84-31205
N84-31206

POSSIEL, N. C. N84-31207
POST, H. N. N84-31806
POSUKH, V. G. N84-31797
POTEKHINA, Y. A. N84-32103
POWELL, C. A. N84-32088
PRALUS, Y. N84-32124
PRATT, D. T. N84-31661
PRENGER, F. C. N84-31279
PRESKAR, W. N84-31582
PREUSS, L. N84-32243
PRICE, C. W. N84-31269
N84-31354
N84-31355
PROKHOROV, A. M. N84-32098
N84-32099
PROMISEL, D. M. N84-31247
PUCKETT, J. A. N84-31670
PUGLISI, M. N84-32145
PULLIAM, T. N84-31094
PURSER, F. O. N84-31498
PUZANOV, S. L. N84-32070
PYPER, J. W. N84-31329

R

RABINOVICH, O. S. N84-32076
RACETTE, G. W. N84-31266
RADERMACHER, R. N84-31426
RADHAKRISHNAN, K. N84-31280
RAINER, R. N84-31388
RAJU, I. S. N84-31666
RAJU, S. R. N84-31616
RALL, F. T., JR. N84-31181
RALL, L. B. N84-32011
RAMPINO, M. R. N84-32327
RAMSEY, K. G. N84-31471
N84-31472
RANDALL, P. M. S. N84-31241
RANJAN, R. N84-31712
RAO, K. S. N84-31473
RAO, P. V. N84-31349
RAO, S. T. N84-31101
RAO, V. S. N84-31846
N84-31867
N84-31866
RASCH, P. J. N84-31885
RASSET, T. L. N84-31153
RAVASSARD, P. N84-31424
N84-31425
RAY, S. N. N84-31961
RAYZER, Y. P. N84-32060
REBBI, C. N84-32217
REBY, J. N84-31372
N84-31373
REDDING, D. C. N84-31240
REDDY, J. N. N84-31691
REDKOVSKIY, N. N. N84-32080
REECE, C. E. N84-32112
REED, D. A. N84-31966
REES, J. N84-32141
REES, J. R. N84-32149
REESE, R. W. N84-31541
REICHERT, C. F. N84-31464
REID, D. E. N84-31605
REINMAN, G. L. N84-32023
REISER, B. N84-32005
RENARDY, M. N84-31568
RENARDY, Y. N84-31565
RENAUDIN, J. F. N84-31963
REPH, M. G. N84-31956
RHODES, C. N84-31597
RIBAKO, S. I. N84-31842
RIBEIRO, M. D. G. N84-31869
N84-31870
RICE, S. L. N84-31365
RICHARDS, P. L. N84-31327
N84-32173
RICHARDSON, J. J. N84-32229
RICHEY, A. N84-32305
RICHMAN, H. N84-31304
RICKER, R. E. N84-31339
RIDDELL, J. D. N84-31268
RIEMENSCHNEIDER, S. N84-32006
RIGAUT, B. N84-31659
RIGDON, G. G. N84-31965
RIGGIN, R. M. N84-31333
RINALDUCCI, E. J. N84-32235
RIVENEZ, J. N84-31660
N84-31662
N84-32162
ROBB, J. H. N84-31129
ROBBEN, F. N84-31322
ROBERTS, A. S., JR. N84-32220
ROBERTS, G. O. N84-31863
N84-32202
ROBERTS, J. N84-31869
N84-31870
ROBERTS, M. N84-31543
ROBERTS, T. G. N84-31407
ROBINETTE, K. M. N84-31939
ROBINSON, M. T. N84-32150
ROBINSON, W. L. N84-31631
ROCHE, M. F. N84-31539
ROCKWELL, T. H. N84-31945
RODIERE, C. N84-31508
RODRIGUES, J. A. N84-31515
ROE, G. N84-31174
ROE, R. J. N84-31384
ROESSNER, B. N84-31301
ROHDE, A. N84-32177
ROHDENBURG, C. N84-32305
ROMANI, J. C. N84-31224
N84-31650
ROMANOFSKY, R. R. N84-31461
ROMANYUK, I. I. N84-32107
ROMO, J. G. N84-31358
RONCHETTI, E. N84-32024
ROSEN, M. N84-31627
ROSNER, D. A. N84-31558
ROSS, M. C. N84-32161
ROSS, M. E. N84-31295
ROSSI, G. N84-31799
N84-31800
ROTH, J. A. N84-32174
ROTH, S. D. N84-32111
ROTHMAN, M. F. N84-31346
ROUCHOUSE, G. N84-31423
ROURIGUIERES, J. L. N84-31507
ROUQUEIROL, V. A. E. N84-31113
ROUSSOS, L. A. N84-31226
ROUWEN, A. J. P. N84-31940
RUBIN, V. M. N84-32057
RUBINOV, A. N. N84-32067
RUEGGEGGER, T. N84-31973
RUSSELL, S. J. N84-31613
RUSTHOI, D. P. N84-31498
RYBIN, I. A. N84-31933
RYDELEK, P. A. N84-31823
RYTTER, L. J. N84-32241
RYUTIN, A. A. N84-32077
RYZHECHKIN, S. A. N84-32067

S

SADANANDA, K. N84-31702
SAFFMAN, P. G. N84-31849
SAGOT, J. M. N84-31502
SAIJA, R. N84-31489
SAILER, C. N84-31748
SAILER, C. T. N84-31744
SAKAI, K. N84-32183
SAKHANOVA, V. V. N84-32098
SALAMON, D. N84-32002
N84-32010
SALFI, R. E. N84-31732
SALTER, R. M. N84-31140
SALZANO, F. J. N84-31410
SAMSON, J. A. R. N84-32130
SANBORN, V. A. N84-31875
SANDER, O. R. N84-31498
SANDERS, J. L. N84-32266
SANDERS, R. D., JR. N84-31576
SANDERSON, S. N. N84-31529
SANFORD, T. W. L. N84-32155
SANTEK, D. N84-31666
SANTI, G. N84-31255
SANTORO, G. J. N84-31558
SAPOVA, N. I. N84-31925
SARIDIS, G. N. N84-31647
SARJEANT, W. J. N84-31546
SARRAILHE, S. R. N84-31102
SASAO, M. N84-32182
SASS, J. H. N84-31854
SATHER, D. N84-31559
SATO, K. N. N84-32182
SATYAMURTY, P. N84-31846
N84-31867
SAUSER, D. N84-31419
SAVENKOV, V. N. N84-31441
SAWAMIPHAKDI, K. N84-31692
SAYPER, V. A. N84-32099
SCHAEFER, B. E. N84-32337
SCHAEFER, R. A. N84-32236
SCHAEFER, W. N84-31269
SCHAIRE, S. N84-31141
SCHANTZ, R. E. N84-31950
SCHERR, K. L. N84-31606
SCHIPPERS, H. N84-32018
SCHMIDT, D. K. N84-31214
SCHMIDT, G. K. N84-31215
SCHMIDT, J. M. N84-31814
SCHMIDT, R. N84-31483
SCHNEIDER, B. I. N84-32139
SCHNEIDER, W. A. N84-31476
SCHOPF, G. N84-31183
SCHOWENGERDT, R. N84-31759
SCHRIMPF, R. J. N84-31482
N84-31483
SCHROEDER, K. G. N84-31470
SCHULLER, I. K. N84-31531
SCHWARTZ, H. J. N84-31272
SCHWEDT, G. N84-31301
SCHWEIGHARDT, F. K. N84-31330
SCHWING, R. L. N84-32253
SCOGGINS, W. R. N84-31977
SCOTT, G. W. N84-31783
SCUDDER, D. W. N84-32199
SEEMAN, J. T. N84-32161
SEGUR, H. N84-32013
SEHITOGLU, H. N84-31673
SEKA, W. N84-32190
SEKAR, R. N84-31641
SELCOW, E. C. N84-32185
SELINCE, G. N84-31253
SELLERS, D. N84-32301
SEMMEL, M. L. N84-31376
SENA, J. T. N84-31561
SENKO, A. A. N84-32078
SENSKE, W. N84-31614
SERBETO, A. D. P. S. N84-31618
SERGEYEVA, A. N. N84-31933
SERGEYEZ, A. G. N84-31441
SERNKEN, N. N84-31456
SEVASTYANENKO, V. G. N84-32106
SEVERNYY, A. N84-31233
SEYDEL, J. A. N84-31714
SHAFAI, L. N84-31473
N84-31476
SHAFFER, L. E. N84-32265
SHAFTER, A. W. N84-32323
SHAHINIAN, P. N84-31702
SHARMA, A. M. N84-31860
SHAW, S. D. N84-31275
SHCHEMELININ, V. M. N84-31436
SHEA, M. F. N84-32140
SHEALY, D. L. N84-32188
SHELKIN, S. D. N84-31765
SHELPYAKOV, A. N. N84-32058
SHELTON, J. P. N84-31468
SHEN, M. Y. H. N84-31960
SHEN, Y. R. N84-32071
SHENDAKOV, A. I. N84-31443
SHEPARD, K. W. N84-32154
SHEPHERD, J. T. N84-31182
SHEPHERD, K. P. N84-32120
SHEPPARD, J. C. N84-32161
SHERRY, R. J. N84-31295
SHIMER, D. W. N84-31528
N84-31532
N84-31534
SHIRSHEV, L. G. N84-31466
SHIU, Y. J. N84-31616
SHLACHTER, J. S. N84-32196
SHOEMAKER, W. L. N84-32033
SHOLEEM, C. M. N84-32165
SHORE, R. A. N84-31464
SHORT, D. N84-31292
SHORT, R. N84-32190
SHORT, R. W. N84-32188
SHOTOV, A. P. N84-32097
SHOW, R. S. N84-31726
SHPARK, M. B. N84-31908
SHTEYNSHLEYGER, V. B. N84-32049
SHULMAN, Y. I. N84-31906
SHUMSKIY, V. V. N84-32061
SHUTTLEWORTH, W. J. N84-31869
N84-31870
SHYMAN, C. S. N84-31177
SIGAREV, A. A. N84-32053
SILCOCK, H. N84-31155
SILL, J. E. N84-31133
SILVA, C. A. B. N84-31517
SILVA, O. D. N84-31998
SILVA, V. D., FILHO N84-31669
SIMETKOSKY, M. N84-32305
SIMON, A. N84-32188
N84-32190
SIMONDS, R. A. N84-31290
SINNECKER, W. D. N84-32178
SINNOTT, D. H. N84-31469
SINYAVSKIY, A. V. N84-32072
SISAKYAN, I. N. N84-32099
SISTIA, G. N84-31101
SITARAM, N. N84-31209
SITNYAKOVSKIY, I. V. N84-31428
SKARPERDAS, G. N84-31410

SKLAR, B. N84-31780
SKOTHEIM, T. A. N84-31530
SKVORTSOV, A. T. N84-32048
SLETTEN, C. J. N84-31484
SLICKER, J. M. N84-31514
SLIWA, S. M. N84-31213
SLONIM, A. N84-31910
SMALL, G. J. N84-31316
SMARTT, H. B. N84-31657
SMIRNOV, K. M. N84-31921
SMITH, C. W. N84-32333
SMITH, E. P. N84-31854
SMITH, G. N84-32305
SMITH, J. A. N84-31648
SMITH, J. L. N84-31544
N84-31638
SMITH, K. O. N84-31385
SMITH, P. J. N84-31945
SMITH, R. E. N84-31560
SMITH, R. F. N84-31783
SMITH, R. H. N84-31180
SMITH, S. N84-31973
SMITH, T. N84-31739
N84-32243
SMITH, T. R. N84-31743
N84-31744
SMITH, W. H. N84-32165
SMOVZH, A. K. N84-32051
SNOW, C. C. N84-31939
SNYDER, F. W. N84-32257
SNYTNIKOV, V. N. N84-32103
SOKOLOVA, Z. A. N84-31922
SOLECKI, R. N84-31365
SOLLER, D. R. N84-31815
SOLOMEN, I. L. N84-31909
SOLOMON, A. D. N84-31647
SOLOUKHIN, R. I. N84-32106
SOMORJAI, G. A. N84-31325
N84-32213
SONOV, A. M. N84-31434
SOOD, M. N84-31774
N84-31775
SOOSAAR, K. N84-32317
SOROKA, A. M. N84-32065
SOULEZELLE, B. N84-31298
SOUREN, E. N84-31139
SOUZA, C. D. E. N84-31998
SPEELMAN, L. W. N84-31154
SPEGT, P. N84-31299
SPENCER, F. W. N84-31658
SPENCER, J. H. N84-32221
SPENCER, J. L. N84-31184
SPERO, A. J. N84-31500
SPINAK, A. N84-31200
SPITAL, R. N84-32264
SPRAGUE, M. E. N84-32309
SPRANGLE, P. N84-32132
SPYCHALSKI, S. E. N84-31851
ST.JOHN, W. N84-31973
STACEY, W. M., JR. N84-32191
STAFSUDD, O. M. N84-31621
STAGGS, M. C. N84-31388
STANEK, E. K. N84-31548
STANKE, F. E. N84-32110
STANLEY, A. E. N84-31402
STANSFIELD, S. A. N84-31241
STAR, J. L. N84-31739
N84-31741
N84-31743
N84-31746
N84-31747
STEARNS, C. A. N84-31558
STEEB, R. N84-31106
STEELE, G. L., JR. N84-31137
STEINBERG, D. M. N84-32001
N84-32003
STENGEL, J. D., JR. N84-32244
STEPANOV, V. V. N84-32099
STEPANOVA, L. P. N84-31919
STEPHENS, C. W. N84-32245
STEPURO, A. V. N84-31439
STERMAN, M. B. N84-31947
STIENNO, R. F. N84-32161
STILLER, P. H. N84-31783
STOLOFF, N. S. N84-31705
STONE, D. N84-32237
STONE, J. R. N84-31096
STONE, R. H. N84-31287
STONE, W. J. N84-31602
STOTT, J. H. N84-31455
STOUGHTON, R. S. N84-31606
STOVER, C. N84-32216
STRANG, W. Z. N84-31096
STRANGE, K. L. N84-31276
STRAUB, E. C. N84-31187
STRAUB, D. M. N84-31638
STREDULINSKY, E. W. N84-32007
STREET, H. K. N84-31537
STRIKWERDA, J. C. N84-32171
STROHMEIER, H. N84-31309
STROKOVA, I. I. N84-32273
STROOCK, D. N84-32032
STROTHERS, R. B. N84-32327
STULEMEIJER, I. P. J. M. N84-31593
STURGESS, G. J. N84-31275
SUCHMAN, D. N84-31666
SUCIU, D. F. N84-31576
SULLIVAN, J. H. N84-31323
SULTANGALEYEV, R. N. N84-31444
SUMIHARA, K. N84-31690
SUMMERSCALES, J. N84-31292
SUNDSTROM, B. M. N84-31130
SURIN, V. A. N84-32057
SURIS, R. A. N84-32053
SUTO, E. N84-32296
SUTO, F. N84-32042
SUTTER, B. N84-31371
N84-31372
N84-31373
SVECHNIKOV, S. V. N84-32051
SVERDLOVA, A. M. N84-32052
SWALLOW, C. E., JR. N84-31175
SWANN, T. G. N84-31163
SWARTZ, C. K. N84-31513
SWEC, D. M. N84-31512
SYLVESTER, R. J. N84-32252
SYLVESTER, W. B. N84-31732
SYROMYATNIKOV, V. S. N84-31444
SYS, A. N84-31655
SZABO, N. N84-32246
SZCZUR, M. R. N84-31949

T

TABIBI, B. N84-31616
TAEUBER, H. N84-32178
TAFF, L. G. N84-31241
TAKAGI, S. N84-32182
TAKEUCHI, S. N84-32183
TALBOT, L. N84-31322
TANAKA, K. N84-32190
TARAKJI, M. G. N84-31220
TARASEVICH, A. P. N84-32097
TASHJIAN, R. N84-31784
TATULYAN, S. A. N84-31923
TATUM, J. E. N84-31615
TAYLOR, B. S. N84-32296
TAYLOR, E. W. N84-31454
TAYLOR, P. L. N84-31383
TAYLOR, R. C. N84-31482
TAYLOR, R. D. N84-32160
TAYLOR, R. G. N84-31483
TEEGARDEN, B. G. N84-32337
TELEGIN, G. G. N84-32095
TELESMAN, J. N84-31348
TEMNOV, A. N. N84-32058
TEPPER, S. N84-31458
THAYER, A. E. N84-31335
THIEL, P. A. N84-31327
THIVET, R. N84-31332
THOMAS, M. T. N84-31389
THOMAS, R. N84-31422
THOMAS, R. H. N84-31950
THOMAS, S. J. N84-32280
THOMPSON, P. F. N84-32218
THOMSEN, M. F. N84-31855
THORPE, D. J. N84-31148
THRON, W. N84-31859
TIELENS, A. G. G. M. N84-32328
TIEN, T. Y. N84-31392
TIERNAN, T. O. N84-32036
TIFFANY, S. H. N84-31684
TIGHE, R. J. N84-31960
TIKHOMIROV, B. A. N84-32047
TIKHONOV, A. N. N84-32077
TILLER, W. A. N84-31662
TINNEY, L. R. N84-31744
N84-31748
TISUE, M. N84-31774
N84-31775
TITOVA, N. A. N84-31920
TO, C. W. S. N84-31678
TOBIN, R. G. N84-31327
TOLA, R. N84-31724
TOLSTIKHIN, V. I. N84-31453
TOMLINSON, J. P. N84-32296
TOMPKINS, H. G. N84-31321
N84-31396
TONG, H. M. N84-32248
TORNUYEV, Y. V. N84-31932
TORO, E. F. N84-31556
TOTH, J. F. N84-31475
TOTH, W. J. N84-31576
TOWNSEND, J. F. N84-31887
TOWNSEND, T. E. N84-31727
TOWSEND, S. W. N84-31622
TRAEGER, R. K. N84-32298
TRAVIS, J. R. N84-31317
TREINISH, L. A. N84-31956
TRIANTAFYLLOU, M. S. N84-31780
TRIPOLI, G. N84-31871
TRIPP, L. L. N84-31194
TROFIMENKO, I. T. N84-32096
TSAI, S. N84-31774
TSELNIK, F. A. N84-32194
N84-32195
TSEPELEV, V. Y. N84-32065
TSURITA, Y. N84-32182
TUDE, E. A. P. N84-31516
TUDOR, A. A. N84-31648
TUEGEL, E. J. N84-31674
TUKEY, J. N84-32022
TULUPOV, A. N. N84-31923
TUNKIN, V. G. N84-32097
TURBAT, A. N84-31716
N84-31718
TURKEL, E. N84-31993
TURNER, C. R. N84-31151
TURNER, J. E. N84-31325
TUROVSKAYA, T. S. N84-31439

U

UGRYUMOV, Y. A. N84-32089
ULMISHEK, G. N84-31772
UMSTEAD, M. E. N84-31401
URBAN, L. J. N84-31182
USUI, Y. N84-31677

V

VAJO, V. N84-31128
VAKKALANKA, K. V. N84-31148
VALLARIO, R. W. N84-31585
VANAST, C. I. N84-32205
VANCON, M. N84-31296
VANDELUNE, J. N84-32030
VANDENASSEM, D. N84-31592
VANDENDAM, R. F. N84-31984
VANDERHOEVEN, P. C. T. N84-32025
VANDERVELDE, W. E. N84-31219
VANDEVENTER, E. H. N84-31544
VANGULICK, L. A. N84-31711
VANKA, S. P. N84-31577
VANLEER, B. N84-31993
VANLINT, V. A. J. N84-31288
VANLUIK, A. N84-31775
VANMOORHEM, W. K. N84-32121
VANNICE, M. A. N84-31314
VANSTRUM, M. D. N84-31462
N84-31463
VARAIYA, P. N84-32287
VASANTH, K. L. N84-31981
VASILYEV, A. B. N84-32094
VASILYEV, A. N. N84-32082
VASILYEV, V. P. N84-31446
VASSEUR N84-31372
VATSKY, A. N84-32305
VAUGHAN, O. H., JR. N84-31597
VDOVIN, V. L. N84-32200
VEDRENNE, G. N84-32337
VEENHUIZEN, S. D. N84-31680
VELEZ, L. E. N84-31159
VENKATARAMAN, N. S. N84-31246
VENKATESAN, C. N84-31216
VERDIER, J. E. N84-31170
VERNEY, S. N84-31590
VERSTEGEN, M. N84-32228
VIJAYKUMAR, N. L. N84-31994
VINAS, A. F. N84-32333
VODOLZHENKO, A. V. N84-31442
VOLAIT, M. N84-31721
VOLKONSKIY, V. S. N84-31447
VOMVORIDIS, J. L. N84-32132
VONNEGUT, B. N84-31597
VOROBYEV, S. A. N84-32084
VORONINA, N. N. N84-32044
VOSEN, S. R. N84-31575
VUKOBRATOVICH, D. N84-31634
N84-31635
N84-31636
N84-31637
VYACHESLAVOV, L. N. N84-32104
VYSKREBENTSEV, A. I. N84-32060

W

WADDELL, E. N84-31899
WADE, J. E. N84-31878
N84-31879
WAGNER, M. L. N84-31151
WAGNER, R. M. N84-32312
WAHBA, N. H. N84-31701
WALDMANN, D. N84-31206
WALES, C. E. N84-32236
WALIGORA, J. M. N84-31935
WALITT, L. N84-31095
WALKER, J. A. N84-31751
N84-31752
WALKER, R. B. N84-32259
WALLERSTEDT, R. L. N84-31850
WALRAFEN, G. E. N84-31305
N84-32172
WALSH, W. J. N84-31545
WAMPLER, F. B. N84-31405
WANG, C. N84-31627
WANG, L. K. N84-31335
WANG, P. S. N84-31695
WANG, S. T. N84-31534
WANG, W. C. N84-31874
WANGLER, T. P. N84-31497
WARD, M. G. N84-31262
WARNATZ, J. N84-31311
WARNE, L. K. N84-32180
WARNER, B. E. N84-31625
WARNER, D. N., JR. N84-31215
WARNER, P. N84-32145
WARREN, L. C. N84-31404
WARSI, W. E. K. N84-31824
WATTS, J. A. N84-31881
WAX, M. N84-31486
WEALTHY, H. D. N84-31555
WEAVER, H. J. N84-31223
WEBSTER, F. N84-31902
WEFEL, J. P. N84-32336
WEGNER, H. N84-31613
WEI, G. C. N84-31297
WEI, W. N84-31665
WEILL, G. N84-31299
WEIMER, D. N84-32169
WEINBERG, I. N84-31513
WEISBIN, C. R. N84-31647
WEISSHAAR, T. A. N84-31214
WEN-QIANG, L. N84-31465
WENDT, H. N84-31196
N84-31197
WERTZ, W. E. N84-31816
WESTBROOK, C. K. N84-31575
WESTERN, L. R. N84-32313
WEWERKA, E. M. N84-32164
WHANG, K. Y. N84-32281
WHARTON, W. W. N84-31404
WHEELER, D. R. N84-31379
WICZER, J. J. N84-31791
N84-32176
N84-32208
WIDDER, P. A. N84-32245
WIDNESS, S. N84-31773
WIENCLAW, R. A. N84-32232
WIGLE, G. B. N84-31194
WIKOFF, P. M. N84-31576
WILDE, D. N84-31533
WILEY, D. S. N84-31266
WILLIAMS, J. C. N84-31353
WILNAI, D. N84-31152
WILREKER, V. F. N84-31783
WILSON, M. L. N84-31561
WILSON, R. B. N84-31700
WILSON, R. E. N84-31794
WILSON, W. E. N84-32142
WILTANEN, D. O. N84-31548
WINGET, J. N84-31694
WINTER, C. F. N84-31484
WINTER, T. P. N84-31942
WINTERS, M. N84-31774
WITA, C. N84-31289
WOEST, W. N84-31614
WOJCIECHOWSKI, C. J. N84-31273
WOJTOWICZ, J. N84-31472
WOLFF, S. N84-31617
WOLSKY, A. M. N84-31414
WONG, E. N84-32287
WONG, H. K. N84-32333
WONG, M. Y. N84-31735
WONG, S. M. N84-32205
WOOD, C. M. N84-31639
WOODRUFF, C. M., JR. N84-31858
WOODS, K. D. N84-31740
WOOLSEY, G. D. N84-31361
WRIEDE, M. N84-31610
WRIGHT, H., JR. N84-31775
WRIGLEY, C. A. N84-31942
WU, C. F. J. N84-32008
WU, J. J. N84-31703
WU, R. I. C. N84-32036
WUEBKER, F. E. N84-31138
WYNVEEN, R. A. N84-32165

Y

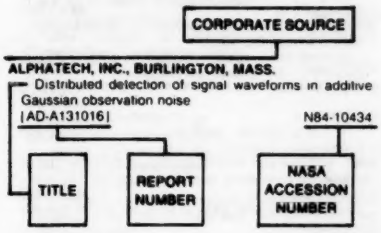
YAKOVLEV, V. V. N84-31447
YAMADA, Y. N84-31379
YAMAMOTO, R. N84-31458
YAMAUCHI, G. N84-31090
YANENKO, N. N. N84-32055
YANG, D. L. N84-31621
YANG, H. C. N84-32212
YAROSLAVTSEV, M. I. N84-32061
YARTSEV, P. M. N84-31931
YATSUI, K. N84-32184
YAU, Y. W. N84-32129
YEE, J. H. N84-31498
YEFIMTSOV, B. M. N84-32059
YEGOROV, Y. A. N84-31440
YEMELYANOV, V. B. N84-31351
YEN, J. H. N84-32024
YERMAK, Y. N. N84-32063
YEVCHENKO, V. N. N84-32057
YEZDIN, B. S. N84-32092
YONG, Y. K. N84-31675
YOO, S. J. N84-32156
YOSHIYAMA, J. M. N84-31295
YOUNG, D. N84-31847
YOUNG, F. C. N84-32187
YOUNG, J. N84-31948
YOUNG, J. S. N84-31971
N84-31972
YOUNG, J. W. N84-31939
YOUNG, M. N84-32179
YOUNT, J. A. N84-31845
YULBERDIN, Y. F. N84-31451
YUROV, V. Y. N84-32098
YUST, C. S. N84-31395

Z

ZADNEPROVSKII, B. I. N84-32203
ZASAVITSKIY, I. I. N84-32097
ZEHNER, G. F. N84-31939
ZEISLOFT, J. N84-31769
ZELTSER, S. R. N84-32273
ZEMPOLICH, B. N84-31134
ZHENG, Y. F. N84-31943
ZHI, G. N84-31620
ZHI, K. N84-31465
ZHIZHIN, G. N. N84-32053
ZHUK, V. A. N84-32103
ZHUKINSKIY, I. N. N84-31447
ZHURAVLEV, Y. I. N84-32079
ZIENTEK, M. L. N84-31818
ZIJM, W. H. M. N84-32028
ZIMMER, G. N84-31610
ZIMMERMAN, A. H. N84-31523
ZIPPERIAN, T. E. N84-32206
ZUBKOV, V. I. N84-32050
ZUBKOVA, S. M. N84-31922
ZWIEGEL, J. N84-31269

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

AAI CORP., BALTIMORE, MD.
Managing a low quantity, high technology trainer development program
[AD-P003464] N84-32241
Automated software testing
[AD-P003498] N84-32264
Automatic audit information system for software development
[AD-P003499] N84-32265

AAI CORP., COCKEYSVILLE, MD.
Software progress tracking system
[AD-P003488] N84-32255

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Advanced Technology for SAM Systems Analysis Synthesis and Simulation
[AGARD-LS-135] N84-31248
Composite structure repair
[AD-A141456] N84-31300
Calendar of selected aeronautical and space meetings
[AGARD-CAL-84/1] N84-32341

AEG-TELEFUNKEN, FRANKFURT AM MAIN (WEST GERMANY).
Crystalline photoconductive films for electrophotographic recording
[BMFT-FB-T-84-099] N84-31614

AEG-TELEFUNKEN, WEDEL (WEST GERMANY).
Silicon solar cells: Development and qualification of thin (50 to 100 micron) and large area (5 cm x 5 cm) high efficiency cells
[BMFT-FB-W-84-016] N84-31798

AEL INDUSTRIES, INC., LANSDALE, PA.
Computer analysis of phased array far-field patterns for non-symmetrical feed networks
[AD-P003502] N84-31470

AEROMETRICS, INC., MOUNTAIN VIEW, CALIF.
Analysis and testing of a new method for drop size measurement using laser scatter interferometry
[NASA-CR-174636] N84-31595

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N. J.
Research in nonlinear motion
[AD-A143000] N84-32013

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Simulated crash decelerations in a light aircraft cabin
[AD-A142806] N84-31102
Extensions and modifications to the ARL point-performance program
[AD-A142078] N84-31113
Fuselage torsion of a CT4 aircraft
[AD-A142753] N84-31114
Calibration of CT-4A fatigue test article, March 1983
[AD-A142880] N84-31115
Some factors affecting the selection of the type of new transonic tunnel to best meet Australian needs
[AD-A142957] N84-31222
Evaluation of a vibration technique for detection of barely-visible impact-damage in composites
[AD-A142807] N84-31293
How many specimens? An aid in the design of fatigue test programs
[AD-A142810] N84-31704

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 1
[AD-A142776] N84-31121
JOVIAL language control procedures with a view toward Ada (Trademark)
[AD-P003522] N84-31126
MIL-STD-1553B validation testing
[AD-P003544] N84-31148
MIL-STD-1750A verification testing
[AD-P003555] N84-31159
Proceedings papers of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference, volume 2
[AD-A142777] N84-31165
An introduction to the avionics integrity program
[AD-P003565] N84-31170
MIL-PRIME Program System
[AD-P003576] N84-31181
Proposed MIL-STD for avionics installation interfaces
[AD-P003578] N84-31183
LANTIRN (Low Altitude Navigation and Targeting Infrared System for Night) - tommorrow's software development today
[AD-P003583] N84-31188
MATE standardization
[AD-P003587] N84-31192
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 3: Embedded computer resources governing documents
[AD-A142778] N84-31201
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 4: Tutorial: MIL-STD-1553 multiplex data bus
[AD-A142779] N84-31202
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 5: Tutorial: MIL-STD-1589 JOVIAL (J-73) high order language
[AD-A142780] N84-31203
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 6: Tutorial: MIL-STD-1679 weapon system software development
[AD-A142781] N84-31204
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 7: Tutorial: MIL-STD-1750, 16 bit instruction set architecture
[AD-A142782] N84-31205
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 8: Tutorial: MIL-STD-1815 Ada high order language
[AD-A142783] N84-31206
Proceedings of the 2nd AFSC (Air Force Systems Command) Avionics Standardization Conference. Volume 9: Tutorial: Navy case study implementation of military standards
[AD-A142784] N84-31207
Managing aircraft/simulator concurrency
[AD-P003463] N84-32240
An approach to a standardized simulator data base
[AD-P003469] N84-32244

AEROSPACE CORP., EL SEGUNDO, CALIF.
Automatic digital battery cell capacitance measurements
[AD-A143143] N84-31523

AEROSPACE CORP., LOS ANGELES, CALIF.
MIL-STD-1750A as a spaceborne instruction set architecture
[AD-P003554] N84-31158

AIR FORCE ARMAMENT LAB., EGLIN AFB, FLA.
MIL-STD-1760 development program
[AD-P003526] N84-31130

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
AFGL cloud modeling program: Annex
[AD-A143084] N84-31872

AIR FORCE HUMAN RESOURCES LAB., WILLIAMS AFB, ARIZ.
Pilot oriented performance measurement
[AD-P003450] N84-32227
Training capabilities: The facility part of the equation
[AD-P003457] N84-32234
Visual cueing effectiveness: Comparison of perception and flying performance
[AD-P003458] N84-32235
Data base generation: Improving the state-of-the-art
[AD-P003470] N84-32245
Fiber optic helmet mounted display: A cost effective approach to full visual flight simulation
[AD-P003482] N84-32249
Training the multiple-aircraft combat environment
[AD-P003495] N84-32261

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Shock-free transonic airfoil design by a hodograph method
[AD-A142752] N84-31098
Time-dependent oscillations in a CW HF chamical laser unstable resonator
[AD-A142966] N84-31622

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Forging and stamping nonferrous metals. Handbook
[AD-A141689] N84-31351
On waves in nonadiabatic and nonequilibrium gases
[AD-A141450] N84-31485
Ionizing emissions and electronics
[AD-A142065] N84-31486
Simplified Navier-Stokes equations and combined solution of non-viscous and viscous boundary layer equations
[AD-A141634] N84-31984
Flowing effects in gas lasers
[AD-A141409] N84-31620
Using gas-turbine power stations with aircraft engines for power-and-heat generation
[AD-A142084] N84-31786

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Feasibility assessment of JOVIAL to Ada (Trademark) translation
[AD-P003523] N84-31127
PAVE PILLAR: A maturation process for an advanced avionics architecture
[AD-P003568] N84-31173
Integrated CNI (Communication Navigation and Identification) avionics and future standardization
[AD-P003580] N84-31185
Powder metallurgy of light metal alloys for demanding applications
[AD-A142086] N84-31352

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
Study of the kinetics of hydrogenation using aged catalysis
[DE84-006588] N84-31330

AKRON UNIV., OHIO.
Nonlinear finite element analysis of shells with large aspect ratio N84-31692
Self-adaptive solution strategies N84-31693

ALABAMA UNIV., BIRMINGHAM.
Theoretical design and analysis of the layered synthetic microstructure optic for the dual path X-ray telescope
[NASA-CR-171133] N84-32188

ALABAMA UNIV., HUNTSVILLE.
The study of efficient low-power diffraction designs
[NASA-CR-171142] N84-31598

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION, ARLINGTON, VA.
Proceedings of the 5th Interservice/Industry training equipment conference Volume 1
[AD-A142774] N84-32223
Proceedings of the 5th Interservice-Industry Training Equipment Conference, volume 2
[AD-A142775] N84-32266
AMERICAN DEFENSE PREPAREDNESS ASSOCIATION, WASHINGTON, D. C.
Annual meeting of the Pyrotechnics and Explosives Applications Section on the American Defense Preparedness Association
[AD-A143157] N84-31406
AMES LAB., IOWA.
Versatility of laser induced fluorescence line narrowing in chemical analysis
[DE84-012834] N84-31316
Crack initiation model for stress corrosion cracking alpha-brass
[DE84-012837] N84-31712
Magnetic impurity scattering in in situ superconductors
[DE84-012835] N84-32212
APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
Computational Methods: 1984 JPM Specialist Session
[AD-A142923] N84-31276
Laser Induced Chemistry. 1984 JPM Specialist Session
[AD-A142922] N84-31400
The APL RCS (Radar Cross Section)/statistics code description, illustrations of output, and user's guide
[AD-A142929] N84-31490
ARGONNE NATIONAL LAB., ILL.
High-resolution spectroscopy and dynamics of multiphoton processes in atoms and molecules
[AD-A143017] N84-31303
Use of pulse radiolysis to measure high temperature kinetics
[DE84-011702] N84-31324
Hard Coatings for Tribological Systems Operating under Extreme Conditions
[DE84-009660] N84-31369
Economics of hydrogen production: The next 25 years
[DE84-007279] N84-31414
Glass electrolytes for sodium/sulfur cells
[DE84-013428] N84-31539
Molten carbonate fuel cell cathode development
[DE84-012101] N84-31544
A computerized system for establishing electric-vehicle battery requirements
[DE84-011728] N84-31545
Efficient finite-difference calculation procedure for multi-dimensional fluid flows
[DE84-011710] N84-31577
Thermal oscillations downstream of an elbow in stratified pipe flow
[DE84-006550] N84-31579
The geology and petroleum resources of basins in the Asian Arctic and offshore east Greenland
[DE84-012114] N84-31772
Geology hydrology and mineral resources of crystaline rock areas of Northeastern US
[DE84-013671] N84-31774
Geology, hydrology, and mineral resources of crystalline rock areas of the Lake Superior region, US, part 1
[DE84-012682] N84-31775
Ocean thermal energy conversion: Materials issues
[DE84-012094] N84-31790
Magnetically confined kinetic-energy storage ring: A new fundamental energy-storage concept
[DE84-011531] N84-31793
Ten-year forecasts of water quality in Lake Michigan using a deterministic eutrophication model
[DE84-011425] N84-31804
CO2 forecasting and control: A mathematical approach
[DE84-013454] N84-31882
Concept of a superconducting linac for low-velocity ions
[DE84-011740] N84-32154
Surplus Facilities Management Program. Post-remedial-action survey report for SNAP-8 Experimental Reactor Facility, building 010 site, Santa Susana Field Laboratories, Rockwell International, Ventura County, California
[DE84-009591] N84-32165
Point defects and diffusion mechanisms in the monoxides of the iron-group metals
[DE84-012105] N84-32210
Nonequilibrium segregation and phase instability in alloy films during elevated-temperature irradiation in a high-voltage electron microscope
[DE84-013423] N84-32214
Predictions of entropies of molecules and liquids
[DE84-010504] N84-32216
Galactic cycles and their relationship to life on Earth
[DE84-011737] N84-32329
Three-dimensional model for fusion processes
[DE84-011731] N84-32339
ARINC RESEARCH CORP., ANNAPOLIS, MD.
Standard avionics software: The future strategy for cost-effective avionics
[AD-P003562] N84-31187
ARIZONA UNIV., TUCSON.
Double arch mirror study. Part 1: Preliminary engineering report
[NASA-CR-166589-PT-1] N84-31634
Double arch mirror study. Part 2: Engineering analysis report
[NASA-CR-166589-PT-2] N84-31635
Double arch mirror study. Part 3: Fabrication and test report
[NASA-CR-166589-PT-3] N84-31636
Double arch mirror study
[NASA-CR-166589] N84-31637
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation
[E84-10188] N84-31759
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, WATERVLIET, N. Y.
Longitudinal vibrations of rods of finite length with radial deformation
[AD-A142674] N84-31703
ARMY AVIATION CENTER, FORT RUCKER, ALA.
Concepts for LHX avionics
[AD-P003575] N84-31180
ARMY AVIATION SYSTEMS COMMAND, ST. LOUIS, MO.
Historical research and development inflation indices for Army fixed and rotor winged aircraft
[AD-A142943] N84-31085
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554
ARMY AVIONICS RESEARCH AND DEVELOPMENT ACTIVITY, FORT MONMOUTH, N. J.
Tri-service Combined Altitude Radar Altimeter (CARA): The Army perspective
[AD-P003586] N84-31191
ARMY COMMUNICATIONS-ELECTRONICS COMMAND, FORT MONMOUTH, N.J.
The NEBULA and MCF (Military Computer Family) standardization programs
[AD-P003531] N84-31135
ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, ILL.
Automated Construction Management System (ACMS). Volume 1: User's guide
[AD-A143031] N84-31971
Automated Construction Management System (ACMS). Volume 2: Program documentation
[AD-A143032] N84-31972
ARMY ENGINEER TOPOGRAPHIC LABS., FORT BELVOIR, VA.
Terrain analysis procedural guide for built-up areas (report no. 13 in the ETL (Engineer Topographic Laboratories) series on guides for Army terrain analysts)
[AD-A142918] N84-31768
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Environmental and water quality operational studies. Fluorometric techniques for tracing reservoir inflows
[AD-A143135] N84-31801
ARMY INST. OF DENTAL RESEARCH, WASHINGTON, D. C.
The wetting of ceramic opaque suspensions on oxidized alloy surfaces
[AD-A142899] N84-31381
ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Interdependence of equivalent steady stress, crack growth and failure on sequence and amplitude of irregular loading
[AD-A142951] N84-31707
ARMY MISSILE COMMAND, REDSTONE ARSENAL, ALA.
Seeker systems simulation, present capability and future technology N84-31254
Laser induced polymerization reactions in solid propellant binders N84-31403
Laser induced nitrations of some aliphatic hydrocarbon compounds N84-31404
ARMY MISSILE LAB., REDSTONE ARSENAL, ALA.
CO2 laser decomposition of the alkyl phosphites N84-31402
ARMY RESEARCH AND DEVELOPMENT LAB., FORT BELVOIR, VA.
Status of the development of a long-life engine coolant system
[AD-A143098] N84-31642
ARMY RESEARCH AND TECHNOLOGY LABS., CLEVELAND, OHIO.
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
Reverse engineering of the multiple launch rocket system. Human factors, manpower, personnel, and training in the weapons system acquisition process
[AD-A142849] N84-31247
ATMOSPHERIC AND ENVIRONMENTAL RESEARCH, INC., CAMBRIDGE, MASS.
Humidity/cloud-radiation feedback on possible climatic perturbation due to fossil fuel utilization
[DE84-011895] N84-31874

B

BALL AEROSPACE SYSTEMS DIV., BOULDER, COLO.
Broadband microstrip matching techniques
[AD-P003506] N84-31474
A conformal SHF phased array for aircraft satellite communication
[AD-P003509] N84-31477
BATTELLE COLUMBUS LABS., OHIO.
Digital avionics design for validation
[AD-P003571] N84-31176
Analysis of polynuclear aromatic hydrocarbons in particulate matter by luminescence techniques
[PB84-181882] N84-31333
Study of bipolar batteries
[DE84-013193] N84-31540
BATTELLE INST., FRANKFURT AM MAIN (WEST GERMANY).
Development of a transimpedance amplifier for cryotemperatures, study
[BMFT-FB-W-84-023] N84-31610
BIELEFELD UNIV. (WEST GERMANY).
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[REPT-83-PT-2] N84-32032
BIONETICS CORP., HAMPTON, VA.
Acoustic tests of the MOD-O/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120
BOEING AEROSPACE CO., SEATTLE, WASH.
A corporate approach to an embedded software development and support standard
[AD-P003589] N84-31194
Broadband cavity-backed slot using printed circuit technology
[AD-P003508] N84-31476
BOEING CO., SEATTLE, WASH.
MIL-STD-1750A users group
[AD-P003547] N84-31151
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Flight service evaluation of two aluminum-brazed titanium spoilers
[NASA-CR-172371] N84-31343
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Achieving the benefits of modular avionics design
[AD-P003562] N84-31167
BOEING MILITARY AIRPLANE DEVELOPMENT, WICHITA, KANS.
Concurrency of design criteria: A key to trainer readiness
[AD-P003454] N84-32231
Software documentation support
[AD-P003487] N84-32254
Increased readiness through modularity
[AD-P003491] N84-32257
Profit responsibilities in the simulation and training equipment industry
[AD-P003497] N84-32263
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Cronus, A distributed operating system: Functional definition and system concept
[AD-A142795] N84-31950
BORG-WARNER CORP., CITY OF COMMERCE, CALIF.
Critical speed of centrifugal pumps N84-31677
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Supercritical and chromotography/supersonic jet spectroscopy
[DE84-012124] N84-31312
BRITISH AEROSPACE PUBLIC LTD. CO., BROUGH (ENGLAND).
Advanced cockpit-systems integration
[AD-P003569] N84-31174
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
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[BBC-RD-1984/3] N84-31454

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One method of assessing the validity of organizational-systems modelling [BLL-M-35605-(5828.4)] N84-32222

Special features of information presentation in teaching systems [BLL-M-35604-(5828.4)] N84-32273

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.

Anodic processes and the kinetics of stress-corrosion cracking or corrosion fatigue [DE84-012911] N84-31367

Activities at the Brookhaven National Laboratory integrated test bed for advanced hydrogen technology [DE84-010226] N84-31409

Water vapor electrolysis: Systems considerations and cost/performance benefits [DE84-007389] N84-31410

Rationale for US DOE energy storage program in hydrogen technology [DE84-010225] N84-31411

The effect of current density on anode depolarization economics [DE84-010465] N84-31524

Urban and local source effects on precipitation chemistry [DE84-011848] N84-31803

Discussion of the Ionian and Levantine Seas [DE84-011562] N84-31898

Design fabrication and testing of the BNL radio frequency quadrupole accelerator [DE84-011915] N84-32145

Future accelerators using micro-fabrication technology [DE84-002692] N84-32157

Electroweak interaction parameters [DE84-012910] N84-32159

Numerical calculations in quantum field theories [DE84-010692] N84-32217

BROWN, BOVERI UND CIE, A.G., MANNHEIM (WEST GERMANY).

Intelligent instruments for process measurement techniques (monitoring of sensors) [BMFT-FB-T-84-078] N84-31611

BROWN UNIV., PROVIDENCE, R. I.

An investigation of single-substance horizontal two-phase flow [DE84-012292] N84-31587

Correlation of afferent activity and binocular receptive field properties [AD-A143087] N84-31938

BURTEK CORP., TULSA, OKLA.

Logistic support: A computer manufacturer's viewpoint [AD-P003496] N84-32262

C

CABOT CORP., KOKOMO, IND.

Development of improved low-strain creep strength in Cabot alloy R-41 sheet [NASA-CR-172392] N84-31346

CALGARY UNIV. (ALBERTA).

The response of nonlinear structures to random excitation N84-31678

CALIFORNIA INST. OF TECH., PASADENA.

Synthesis of offset dual shaped subreflector antennas for control of Cassegrain aperture distributions [AD-P003517] N84-31485

CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids [DE84-008936] N84-31572

IUE observations of variable type I Seyfert galaxies N84-31781

Seismicity and crustal structure studies of southern California: Tectonic implications from improved earthquake locations N84-31819

Finite-amplitude interfacial waves [AD-A142787] N84-31849

Electromagnetic radiation and scattering in a plasma with azimuthal biasing field N84-32180

CALIFORNIA UNIV., BERKELEY.

Density fluctuations in premixed turbulent flames [DE84-012055] N84-31322

Continuation of research in computer simulation of integrated circuits [AD-A143006] N84-31970

Resource contention, synchronization, and information structure in distributed systems [AD-A143037] N84-32267

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.

New approaches to photothermal spectroscopy [DE84-009237] N84-31310

Catalyzed photodissociation of water [DE84-012253] N84-31325

Vibrational spectra of CO on Ni(100) studied by infrared emission spectroscopy [DE84-009246] N84-31327

Active material redistribution rates in zinc electrodes: Effect of alkaline electrolyte compositions having reduced zinc oxide solubility [DE84-010709] N84-31525

Technology base research project for electrochemical energy storage [DE84-012248] N84-31535

Continuum theory for fiber suspensions [DE84-012258] N84-31584

Short wavelength optics for future free electron lasers [DE84-012316] N84-31626

Studies in atmospheric chemistry. Part 1: Primary peroxides from hydrocarbons. Part 2: elemental analysis using nuclear reactions [DE84-012246] N84-31857

Beam experiment programs in the USA [DE84-010804] N84-32138

Far infrared optical properties of WbSe3 [DE84-009223] N84-32173

Energy redistribution in diatomic molecules on surfaces [DE84-011442] N84-32213

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.

Modal parameter estimation via shaker versus speaker excitation [DE84-012897] N84-31223

Quality-assurance tests of five Y-12 Kevlar-49 spools used to fabricate strands and reliability specimens for stress-rupture tests [DE84-012373] N84-31295

Analysis of moisture in solids: A review of the last decade or from Pande to the present [DE84-011166] N84-31326

Simulations of erosion/corrosion surface chemical reactions with a laser beam [AD-A143001] N84-31354

Fundamental mechanisms of multi-phase flow erosion/corrosion of solid surfaces [AD-A143041] N84-31355

Metal finishing and vacuum processes groups [DE84-011046] N84-31358

Engineering properties of some coatings [DE84-002715] N84-31390

Viscoelastic and aging characteristics of polymers [DE84-012689] N84-31393

Dynamic overstresses in fibrous polymeric materials [DE84-012605] N84-31394

Dynamic characteristic of intense short microwave propagation in an atmosphere [DE84-002788] N84-31406

The behavior of very large short pulse antennas [DE84-012372] N84-31500

Normal zone detectors for a large number of inductively coupled coils, revision 1 [DE84-011053] N84-31526

Switching transients in a superconducting coil [DE84-012592] N84-31532

Alternative power supply and dump resistor connections for similar, mutually coupled, superconducting coils [DE84-012602] N84-31534

Another attempt to overcome the bent element blues [DE84-007785] N84-31571

Pressure effects on wall heat transfer during flame quenching [DE84-012265] N84-31575

Computer codes for fluid-structure interactions [DE84-011068] N84-31578

Development of long-length wire filament strain gages [DE84-011543] N84-31605

Soft X-ray laser experiments at Norvette Laser Facility [DE84-012594] N84-31627

Diagnostics for an XUV/soft X-ray laser [DE84-012593] N84-31628

Development of a multidetector deflection measurement system [DE84-013560] N84-31631

Thinking big [DE84-007412] N84-31951

DEC LSI-11/HP9895A [illegible]ware [DE84-012412] N84-31952

DYNASD user's manual. Nonlinear dynamic analysis of solids in three dimensions, revision 1 [DE84-012829] N84-31979

Scattering optical activity of chiral molecules: Circular intensity differential scattering and circular differential imaging [DE84-010712] N84-32137

Electromagnetic dissociation of radioactive heavy-ion beams [DE84-012266] N84-32146

Protective plasma envelope [DE84-013316] N84-32194

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Aeroelastic effects in multi-rotor vehicles with application to a hybrid heavy lift system. Part 1: Formulation of equations of motion [NASA-CR-3822] N84-31218

Single and multiple fiber models for fracture of fibrous composites N84-31286

Transport behavior of multivalent beta aluminas [AD-A142966] N84-31382

The application of convolutional codes to continuous phase modulated communication channels N84-31457

The new algorithm for symbolic network analysis N84-31509

Nd-3+ Beta prime prime alumina platelet laser [AD-A142797] N84-31621

Observations of long-period motions of the Earth at the South Pole N84-31823

Measurement and modification of sensorimotor system function during visual-motor performance [AD-A142919] N84-31947

START/TM: A study of start-up and fractional power operation of tandem mirror fusion reactors [DE84-011477] N84-32196

A design automation database for computer aided design of computer systems N84-32278

On the masses of white dwarfs in cataclysmic binaries N84-32323

CALIFORNIA UNIV., SAN DIEGO.

Observations and analysis of solar flares using H Alpha spectral profiles N84-32335

CALIFORNIA UNIV., SANTA BARBARA.

Activities of the Remote Sensing Information Sciences Research Group [E84-10177] N84-31739

Habitability of the Earth N84-31740

NASA pilot land data system N84-31741

Advanced data structure and geographic information systems N84-31742

Applying artificial intelligence to large networks N84-31743

Knowledge-based expert systems for crop identification N84-31744

Knowledge based engineering for spatial database management and use N84-31745

Annotated bibliography of global resources information systems related publications N84-31746

Global resources information system N84-31747

The potential of AI techniques for remote sensing N84-31748

Sensitivity to hypoxia in humans N84-31934

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CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.

Statistical-mechanical study of polyvinylidene fluoride [AD-A143040] N84-31383

Interactive finite elements for general engine dynamics analysis N84-31698

CATALYTIC, INC., PHILADELPHIA, PA.

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[CRIF-MT-159] N84-31655
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Nuclear Magnetic Resonance (NMR) study of glass fiber-epoxy resin composites in the solid state
N84-31299
CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE (FRANCE).
Investigation of LANDSAT D Thematic Mapper geometric performance: Line to line and band to band registration
[E84-10187] N84-31758
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Development of normalized operative mode for making deposits for chemical analysis in MIG/MAG welding
[CETIM-I.S.13.826] N84-31331
Influence of copper on MAG deposits
[CETIM-12-Y-431] N84-31375
Improving comfort of welders by reducing preheating temperatures
[CETIM-12-Y-413] N84-31651
Investigation of in position end to end welding of an aluminum alloy by electron beam
[CETIM-12-Y-442] N84-31652
Preliminary investigation of ways to improve the strength of vertical electroslag welding
[CETIM-100-020] N84-31654
CENTRE TECHNIQUE DES INDUSTRIES MECANIQUES, SENLIS (FRANCE).
Test rig for measuring hydraulic equipment noise
[CETIM-41-H-337] N84-31224
Deposits on light alloys
[CETIM-12-F-380] N84-31371
Pulsed current hard chromium plating
[CETIM-12-F-390] N84-31372
Hydrogen fatigue test
[CETIM-12-F-400] N84-31373
Gaseous cementation in nitrogen-methanol atmospheres
[CETIM-12-G-284] N84-31374
Ammonia boiling in long tubes. Heat transfer and charge loss in vertical and horizontal tubes
[CETIM-14-C-011] N84-31588
Comparative study of heat pump regulation systems. The problem of defrosting evaporators
[CETIM-100250] N84-31589
Measure of mass flow rate in gas-solid two phase fluids; application to pneumatic transport N84-31590
In situ goniometer
[CETIM-5.41.22.0] N84-31609
Compressed air exhaust silencers, summary
[CETIM-11-H-275] N84-31650
Lubrication during cutting: Wear and friction
[CETIM-13-Y-322] N84-31653
Design of an abrasion test under high stress. Application to the characterization of manganese steel quality assurance
[CETIM-12-D-081] N84-31659
Nondestructive testing of bonding by ultrasonic analysis: Preliminary study report proposed investigation program
[CETIM-13-V-010] N84-31660
Computer aided ultrasonic testing
[CETIM-15-H-404] N84-31661
Application of measurements of the propagation velocity of ultrasonic Rayleigh waves to surface inspection of materials
[CETIM-15-H-417] N84-31662
Extension of finite element programs to thermoelastoviscoplastic domains
[CETIM-11-A-102] N84-31716
Transient 3-dimensional thermoelasticity by the integral equations method
[CETIM-11-B-071] N84-31717
Simplified approach to two-dimensional cyclic plasticity problems
[CETIM-11-B-110] N84-31718
Preliminary study on elastoplasticity in large transformations
[CETIM-11-E-360] N84-31719
The hole drilling method for residual stress distribution measurement
[CETIM-100730] N84-31720
NONAX-TRANAX-CASTOR 2D
[CETIM-100940] N84-31721
Fracture mechanics formulas on microcomputers
[CETIM-100980] N84-31722
Signal analysis and data processing system (acoustic and vibratory)
[CETIM-11-H-50-9] N84-31961
Investigation of criteria enabling a two-dimensional grid to evolve while minimizing errors
[CETIM-100980] N84-31982
Optical density radiation dose relationship
[CETIM-100680] N84-32162
CENTRE TECHNIQUE DES INDUSTRIES MECANIQUES, ST. ETIENNE (FRANCE).
Bonding prospectives in Japan
[CETIM-100-14-0] N84-31397
Creep of six glues
[CETIM-1.3N.16.2] N84-31398
Automation of a stamping press using sequential hydraulic manipulators
[CETIM-1-4N-090] N84-31422
Automation of a drop forge at the Centre Techniques des Industries Mecaniques (CETIM) forge section
[CETIM-1.3K.27.3] N84-31423
Industrial forging applications of shaping simulation using modeling clay
[CETIM-1.3K.36.2] N84-31424
Construction of a test bench for closed die forging
[CETIM-5.580.50] N84-31425
Influence of choice of steel on forging
[CETIM-1.3K.32.1] N84-31663
State of techniques for crackling varnishes and problems posed by their application
[CETIM-1.5C.23.1] N84-31723
Improvement of the equipment of very long horizontal tensile test bench
[CETIM-5.510.05] N84-31724
Preliminary investigations of means to transfer computer programs to the forging industry
[CETIM-1.3K.38.2] N84-31983
Study of numerical control systems for machines. Integration in flexible workshops and units
[CETIM-1.3T.042] N84-31991
CETA, ANGOULEME (FRANCE).
Terminal control for command to line of sight guided missile N84-31252
CHINESE AERODYNAMIC RESEARCH AND DEVELOPMENT CENTER, MIANYANG.
The 6M x 6M low speed wind tunnel N84-31221
CHRYSLER CORP., HUNTSVILLE, ALA.
Aerothermodynamic data base, phase C
[NASA-CR-173862] N84-31259
CHRYSLER CORP., MICHOUD, LA.
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[NASA-CR-167686] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
[NASA-CR-167685] N84-31261
CHU ASSOCIATES, INC., LITTLETON, MASS.
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464
CIRCUIT TECHNOLOGY, INC., FARMINGDALE, N.Y.
MIL-STD-1553B Marconi LSI chip set in a remote terminal application
[AD-P003538] N84-31142
CINCINNATI UNIV., OHIO.
Effect of polydispersity on the cloud point curves of polymer mixtures
[AD-A143159] N84-31384
A direct numerical method for the solution of unsteady Navier-Stokes equations in generalized orthogonal coordinates N84-31549
CITY COLL. OF THE CITY UNIV. OF NEW YORK.
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[E84-10169] N84-31732
CITY OF PORTLAND, OREG.
The Electric Vehicle Project
[DE84-011788] N84-32309
CIVIL AEROMEDICAL INST., OKLAHOMA CITY, OKLA.
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[AD-A143096] N84-31939
CLEMSON UNIV., S.C.
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COLLEGE OF WILLIAM AND MARY, NEWPORT NEWS, VA.
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[NASA-CR-3809] N84-31097
Acoustic tests of the MOD-O/5A wind turbine rotor with two different ailerons
[NASA-CR-172427] N84-32120
COLORADO STATE UNIV., FORT COLLINS.
Ion beamlet steering for two-grid electrostatic thrusters
[NASA-CR-174671] N84-31274
The annular flow electrothermal ramjet
[NASA-CR-174704] N84-31275
Compound strip methods for the analysis of continuous elastic plates N84-31670
Response of alluvial rivers to active tectonics N84-31812
Model cloud relationships
[AD-A142690] N84-31871
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31875
Doppler-radar observation of the evolution of downdrafts in convective clouds
[NASA-CR-173874] N84-31896
COLORADO UNIV., BOULDER.
Strength and stiffness of AISC type 2 steel frames N84-31666
The post-buckling equilibrium and the dynamic collapse of complex hyperstatic pin-jointed lattices and reticulated shells N84-31667
Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek Basin, Colorado N84-31825
Geochronology, paleomagnetism and petrology of the Upper Cenozoic Bruneau Formation in the Western Snake River Plain, Idaho N84-31826
Resolution and quantitative accuracy improvements in ultrasound transmission imaging N84-32113
Line studies of Wolf-Rayet stars: The WN subclass N84-32311
Atomic carbon in the Venus thermosphere: Observations and theory N84-32332
COLUMBIA UNIV., NEW YORK.
Thomson backscattering from an intense relativistic electron beam as a diagnostic for a free electron laser
[AD-A143027] N84-31623
Volcanism, plutonism, and sedimentation in a late Devonian Submarine Island-arc setting, Northern Sierra Nevada, California N84-31831
Theoretical high energy physics
[DE84-011854] N84-32153
Safety and deterministic failure analyses in high-beta D-D Tokamak reactors
[DE84-012693] N84-32185
COMMUNICATIONS RESEARCH CENTRE, OTTAWA (ONTARIO).
Experimental evaluation of a high frequency radio data terminal in the ship-shore mode
[CRC-1375] N84-31458
COMPUTER SCIENCES CORP., SILVER SPRING, MD.
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[E84-10056] N84-31731
TM digital image products for applications
[E84-10178] N84-31749
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
TM digital image products for applications
[E84-10183] N84-31754
CONNECTICUT UNIV., STORRS.
Investigation of role of subsurface zones in wear of materials
[DE84-012752] N84-31365
Thermodynamic field theory of the dynamic behavior of bipolar junction transistors N84-31510
Nonlinear inverse methods applied to interpreting gravity anomalies produced by multi-interfaced geologic bodies N84-31822
CONTINENTAL GUMMI-WERKE A.G., HANNOVER (WEST GERMANY).
Holographic test procedures for the evaluation of complicated material composites (tires)
[BMFT-FB-T-84-006] N84-31612
CONTINUUM, INC., HUNTSVILLE, ALA.
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[NASA-CR-171114] N84-31553
COOPER UNION, NEW YORK.
Models for calculating reaction rates in turbulent, reacting flows N84-31281
CORNELL UNIV., ITHACA, N.Y.
Environment and fracture
[DE84-011454] N84-31360
Asteroid light inversion
[NASA-CR-173864] N84-32316
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
Computer-Aided Engineering (CAE) in plastics technology
[CSIR-TRANS-1725] N84-31380

Turning of hardened ferrous materials with homogeneous CBN tool tips
[CSIR-TRANS-1728] N84-31418
New sapphire and ruby components and their manufacture using diamond abrasives
[CSIR-TRANS-1734] N84-31419
Grinding with Borazon: Progress and rewards
[CSIR-TRANS-1718] N84-31420
Internal grinding of high-speed steels: Shorter processing times with boron nitride grinding tools
[CSIR-TRANS-1719] N84-31421
The Lithosphere programme
[CSIR-TRANS-1724] N84-31841
Microtopography of micro-diamonds from sedimentary covers in the southwestern part of the Eastern European platform and a possible genetic interpretation
[CSIR-TRANS-1726] N84-31842
X-ray diffraction study of the phase composition of the crystallization medium and inclusions in synthetic diamonds
[CSIR-TRANS-1723] N84-32203
New technical information media
[CSIR-TRANS-1731] N84-32284
CSIR activities in South Africa
[ISBN-0-7988-3029-8] N84-32340

CRANFIELD INST. OF TECH., BEDFORDSHIRE (ENGLAND).
Quasi-steady flames on an evolving atmosphere
[CAR-8406] N84-31302
Another look at the use of complex sources for the generation of bodies of revolution in incompressible flow
[CAR-8412] N84-31555
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[CAR-8418] N84-31556
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[CAR-8425] N84-31557

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[NASA-CR-168266] N84-31641

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[AD-A143170] N84-31974

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[AD-A143118] N84-31600
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[DE84-004512] N84-31795

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DMA (Defense Mapping Agency): The digital revolution
[AD-A142787] N84-31767

DEFENSE MAPPING AGENCY HYDROGRAPHIC AND TOPOGRAPHIC CENTER, WASHINGTON, D.C.
African Doppler Surveys (ADOS)
[AD-A142738] N84-31764
DMA (Defense Mapping Agency) policy for digital MC and G (Mapping, Charting, and Geodesy) support of advanced systems
[AD-A142746] N84-31765

DEFENSE NUCLEAR AGENCY, WASHINGTON, D.C.
Geodesy for the layman
[AD-A142764] N84-31766

DENVER RESEARCH INST., COLO.
Investigation of shock activated sintering and shock wave consolidation of selected powder materials
[DE84-013074] N84-31391
On-line task analyses in maintenance simulation
[AD-P003452] N84-32229

DEPARTMENT OF ENERGY, OAK RIDGE, TENN.
Refractory alloy technology for space nuclear power applications
[DE84-001745] N84-32166

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
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[DE84-012754] N84-31413
Digital rotation measurement unit
[DE84-010872] N84-31528
Quantum well multijunction photovoltaic cell
[DE84-011113] N84-31529
Improved photovoltaic cells and electrodes
[DE84-011105] N84-31530
Improved superconducting magnet wire
[DE84-011233] N84-31531
Front lighted optical tooling method and apparatus
[DE84-011108] N84-31602
Method and apparatus for measuring response time
[DE84-011042] N84-31603
Plasma discharge elemental detector for a mass spectrometer
[DE84-011078] N84-31604
Laser window with annular grooves for thermal isolation
[DE84-011114] N84-31625
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[DE84-011303] N84-31787
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[AD-P003591] N84-31196
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[AD-P003592] N84-31197

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[AD-D011078] N84-31407
Thixotropic flame inhibitors for rocket propellant grains
[AD-D011081] N84-31408
Voice integrated presentation system
[AD-D011076] N84-31485
Temperature controlled adjusting mechanism
[AD-D011077] N84-31601
Retractable tie-down device
[AD-D011079] N84-31643
Shaft coupling device
[AD-D011080] N84-31644

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[NASA-CR-173839] N84-31957
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E

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[DE84-012542] N84-31321
Dehydration of aluminum chloride hexahydrates: A technical assessment
[DE84-013086] N84-31328
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[DE84-012483] N84-31396
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[DE84-010988] N84-31576
Instrumentation for real-time ultrasonic sensing of arc welding characteristics
[DE84-012536] N84-31649
Real-time ultrasonic sensing of arc welding processes
[DE84-005031] N84-31657
Enhanced Fourier algorithms for ultrasonic crack characterization
[DE84-012544] N84-31714
Data base management system of the National Low-Level Radioactive Waste Management Program
[DE84-012759] N84-32291
Practical writing and editing techniques
[DE84-012842] N84-32294
Terminal oversight: The editor and the word processor
[DE84-012658] N84-32295

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[AD-P003501] N84-31489
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[AD-P003447] N84-32224
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[AD-P003459] N84-32236

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F

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[AD-P003548] N84-31152

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[AD-P003529] N84-31133

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[AD-P003465] N84-32242

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[AD-A143023] N84-31103

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[AD-P003574] N84-31179

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[DE84-012521] N84-32140

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[DE84-012972] N84-31366
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[DE84-012878] N84-31543

G

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[DE84-012471] N84-32186
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Department of Energy's activities to limit distribution of certain unclassified scientific and technical information
[PB84-189158] N84-32302
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[AD-P003525] N84-31129
A common 1553B I/O channel for the F-16
[AD-P003546] N84-31150
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[AD-A142948] N84-31518
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[AD-P003540] N84-31144
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[AD-P003541] N84-31145
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[AD-P003586] N84-31171
Quantum leap in avionics
[AD-P003584] N84-31169
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[AD-P003493] N84-32259
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
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[NASA-CR-171121] N84-31266
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[DE84-900996] N84-31854
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The Quaternary history and stratigraphy of the Cape Fear River valley, North Carolina N84-31815
Solution and sensitivity analysis of RESDYN model 1a using SENSUMT
[AD-A142788] N84-32267
GEORGIA INST. OF TECH., ATLANTA.
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Investigation of neutral beam driven impurity flow reversal as an impurity control method in future Tokamaks
[DE84-006855] N84-32191
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[DE84-006858] N84-32197
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[AD-P003446] N84-32225
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
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[AD-P003530] N84-31134
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[AD-P003512] N84-31480
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[AD-A142976] N84-31522

H

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[NASA-CR-173846] N84-31616
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[NASA-CR-172413] N84-31462
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[AD-A142802] N84-31487
HAZELTINE CORP., MCLEAN, VA.
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[AD-P003460] N84-32237
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[NASA-CR-171122] N84-31594
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[NASA-CR-173860] N84-31596
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[AD-P003455] N84-32232
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[DE84-011506] N84-31357
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[AD-A143131] N84-31305
Raman investigation of the rate of OH uptake in stressed and unstressed optical fibers
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[AD-A143028] N84-32205
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[AD-A143039] N84-32206
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[AD-A143076] N84-32207
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I

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[NASA-CR-173837] N84-31992
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Flapping-torsional response of helicopter rotor blades to turbulence excitation N84-31110
High temperature X-ray decomposition studies of alpha phase nickel-silicon and beta phase copper-aluminum-nickel alloys N84-31338
Phase transformations in nearly stoichiometric nickel-manganese alloys N84-31340
Rapid solidification and undercooling of aluminum germanium alloys: Characterization and control of microstructure
[DE84-012395] N84-31361
Performance of digital communications over selective fading channels N84-31456
A method for the combination of stochastic time varying load effects N84-31669
Modeling the behavior of type 304 stainless steel with a unified creep-plasticity theory N84-31672
Software design issues in the implementation of hierarchical display editors N84-31953
Page indexing for textual information retrieval systems N84-32277
ILLINOIS UNIV., URBANA-CHAMPAIGN.
Numerical solution of the Euler and the Navier-Stokes equations for a compressible flow problem N84-31551
Crack kinetics of the nickel-hydrogen system N84-31665
Characterization of thermo-mechanical fatigue N84-31673
The changes in the compressive and tensile yield strengths during uniaxial cyclic loading N84-31674
Theoretical studies of the pulsar magnetosphere N84-31809
Microfacies, depositional environments and diagenesis of the Amapa carbonates (Paleocene - Middle Miocene) Foz Do Amazonas Basin, offshore northeast Brazil N84-31817
Microfacies, depositional models and diagenesis of Lagoa Feia Formation (lower cretaceous), Campos Basin, offshore Brazil N84-31827
Argillic alteration associated with the Amethyst Vein System, Creede Mining District, Colorado N84-31832
Content duplication among documents on specific subjects N84-32274
The relationship between administrative style and the use of computer-based systems: An attitudinal study of academic library professionals N84-32276
Theoretical models for the polarization of astronomical masers N84-32313
The physical nature of the symbiotic stars N84-32325
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[AD-A1300477] N84-31946
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[NASA-CR-3829] N84-31218
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[CETIM-12-Y-413] N84-31651
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[CETIM-12-Y-442] N84-31652
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[NASA-CR-171130] N84-31459
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Development of a global model for atmospheric backscatter at CO2 wavelengths
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[INPE-3205-PRE/564] N84-31244
Optimization of the capture process for a rigid satellite stabilized by gravity gradient
[INPE-3184-PRE/549] N84-31245
Pitch control of a satellite using stabilizing flaps
[INPE-3185-PRE/550] N84-31246
BRESEY: On board supervision, basic architecture and preliminary aspects for payload and space shuttle interface
[NASA-CR-173673] N84-31271
Phase modulator in 41.650 MHz
[INPE-3177-PRE/544] N84-31515
P-I-N Diode Switches Project
[INPE-3171-PRE/541] N84-31516
Synthesis of MIG-type electron guns for gyrotrons
[INPE-3191-PRE/555] N84-31517
Nonlinear theory of the free-electron laser
[INPE-3193-PRE/557] N84-31618
The INPE handouts to the 6th LANDSAT Technical Working Group (LTWG) Meeting
[E84-10176] N84-31738
Two years experience testing solar collectors in Brazil
[INPE-3221-RPE/461] N84-31785
Nighttime enhancements in the TEC and magnetic storm response of the tropical F-region over Brazil
[INPE-3038-PRE/469] N84-31839
Variability in the height distribution of electrojet currents of Jicamarca
[INPE-3205-PRE/563] N84-31840
Comparison between density profiles obtained at Cachoeira Paulista, Brazil, and deduced from IRI-79 model
[INPE-3136-PRE/527] N84-31843
Temperature oscillations and ozone correlations in the lower stratosphere of Natal (6 deg S)
[INPE-3116-PRE/512] N84-31844
The use of infrared imagery in the study of fault zones
[INPE-3143-PRE/529] N84-31845
On the zonally averaged temperature in the Southern Hemisphere
[INPE-3139-PRE/528] N84-31846
Teleconnections and sea surface temperature anomaly effects on the drought of 1983 in northeast Brazil
[INPE-3214-PRE/567] N84-31867
Interannual variations of rainfall in northeast Brazil and their connections with the large-scale features
[INPE-3207-PRE/565] N84-31868
Daily variations of temperature and humidity within and above Amazonian forest
[INPE-3196-PRE/560] N84-31869
Application of an adaptive noise technique on state estimation to data smoothing
[INPE-3187-PRE/552] N84-31963
Auxiliary programs for the Metal-Enclosed Microstrips Project
[INPE-3172-PRE/542] N84-31964
A fast method for computer image enhancement
[INPE-3170-PRE/540] N84-31965
The surface generation using weighted splines
[INPE-3160-PRE/534] N84-31994
State estimation and parameter identification: An approach involving a pair consisting of the initial state and the trajectory
[INPE-3183-PRE/548] N84-31995
Compensating technique using one active control scheme to nullify the acummulated effect of modelling deviation
[INPE-3181-PRE/546] N84-31996
Smoothing on the frequency domain
[INPE-3182-PRE/547] N84-31997
Tutorial: Fuzzy sets and applications
[INPE-3168-PRE/538] N84-31998
Ray tracing study of electron cyclotron heating in the TBR 2 Tokamak
[INPE-3192-PRE/556] N84-32181
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[INPE-3194-PRE/558] N84-31870
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[AD-P003594] N84-31199
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[AD-P003524] N84-31128
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[PB84-197011] N84-31886
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[NASA-RP-1109] N84-32330
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[JPRS-UTR-84-024] N84-31119
Advanced system for testing new helicopter transmissions N84-31120
USSR report: Space
[JPRS-USP-84-004] N84-31228
Innovations in cosmonaut medical monitoring, physical conditioning N84-31229
Medical research in first 100 days of Salyut-7 flight N84-31230
Cosmonaut Berezovoy's memoirs on 211-day spaceflight N84-31231
Excerpt from cosmonaut Aleksandrov's flight diary N84-31232
Results from Astron satellite after one year in orbit N84-31233
Hypokinesia experiment studies effects of weightlessness N84-31234
Pravda cites advantages of project for orbiting solar reflectors N84-31235
Space transportation systems of the future N84-31236
Advantages of metallic fuels for rocket propulsion N84-31237
Azerbaijan Institute develops subsatellite measurement systems N84-31238
List of recent Soviet space launches N84-31239
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-31427
Results of investigation of adaptive speech codes N84-31428
Use of space-diverse photoreceivers for analysis of interference patterns N84-31429
Adaptive multibeam antenna array N84-31430
Television transmitting antenna of decimeter band system based on tubes 720 and 1020 mm in diameter N84-31431
Adaptive antennas for tropospheric radio relay lines N84-31432
Design of short-wave absorption lines N84-31433
Analysis of noise temperature of optical waveguide N84-31434
Equipment for monitoring and control of television transmitters N84-31435
Multi-criteria approach to selection of optimal connections in large-scale integrated circuits N84-31436
Measurement of integrated circuit element dimensions taking into account real etching profile according to diffraction pattern N84-31437
Realization of high-frequency filters according to theory of guided spherical waves N84-31438
Effect of ion treatment of substrates on initial stage of buildup of metal films N84-31439
Large-signal amplifier based on ferrimagnetic echo N84-31440
Circuit engineering principles for construction of bipolar large-scale integrated circuit storage devices and very large-scale main memory N84-31441
Dielectric-grating band-pass filters N84-31442
Cold-cathode gas-discharge modulator power tube N84-31443
Regulation of mechanical characteristic of iron-powder electromagnetic brake N84-31444
Operating modes of superconducting current converters in service N84-31445
Infrared ellipsometer method for determination of parameters of thin epitaxial structures with buried layer: Specimens with dull inactive surface N84-31446
Phase light range finder N84-31447
Microwave phase modulators using semiconductor diodes (survey) N84-31448
Alternating acoutoelectric current generated by interaction of two waves in acoustic microwaveguide N84-31449
Calculation of hydraulic friction losses in dc motors filled with liquid dielectric N84-31450
Waveguide characteristics of resonators with arbitrary distribution of dielectric permittivity N84-31451
Alignment of multistate laser amplifiers with periodic space filtration of beam N84-31452
Modelling of transfer processes in monopolar semiconductor structures with submicron dimensions N84-31453
USSR report: Life sciences. Effects of nonionizing electromagnetic radiation
[JPRS-UNE-84-001] N84-31903
Medical applications of lasers N84-31904
Age-related responses to de- and hyperhydration N84-31905
Effects of whole-body cold exposure on erythrocyte morphology N84-31906
Effects of climate on kininogen levels in healthy human subjects N84-31907
Heart rhythm changes in response to sensorimotor load of varying complexity N84-31908
Correlation between individual alpha-rhythm parameters and operator's performance while subjected to maximum information input N84-31909
Stability of physiological and psychological human functions under extreme environmental conditions N84-31910
Psychophysiological aspects of monotonous human activity N84-31911
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-012] N84-31916
First mixed crew in space N84-31917
Ergonomic analysis of human operation of video terminal N84-31918
Results of psychophysiological study of Videoton terminal operators N84-31919
Realization of human work capacity: Interdisciplinary problems N84-31920
Stress in work N84-31921
Analysis of some aspects of mechanism of action of helium-neon laser N84-31922
Immediate effects of hyperbaric oxygenation on body oxygen supply N84-31923

USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-017] N84-31924
Link between indexes for mental work capacity and parameters in circulatory system before and after physical stress N84-31925
Effect of body temperature on human work capacity N84-31926
Link between characteristics of EEG rhythms in biofeedback control and indexes for operator activity N84-31927
Quantitative assessment of role of spatial frequencies of images in visual recognition of numbers N84-31928
Link between blood catecholamine levels and individual features in dynamics of operator error N84-31929
Changes in arterial pressure in static work as function of time of day and degree of disturbance in Earth's magnetic field N84-31930
Dynamics of functional status and subjective sensations in process of heat adaptation N84-31931
Study of spatial asymmetry in human external electrical field N84-31932
Psychophysics of proprioceptive sensibility N84-31933
USSR report: Physics and mathematics
[JPRS-UPM-84-003] N84-32043
Dependence of acoustic properties of sound absorbing fibrous materials on their structure N84-32044
Parametric excitation of transverse acoustic slot waves in solids by means of microwave electric field N84-32045
Simulation of vibratory processes in damped structures with temperature-frequency characteristics of vibration absorbing materials taken into account N84-32046
Relation between pressure pulse generated in optoacoustic receiver and intensity of stimulating laser pulse N84-32047
Sound field of turbulent wake N84-32048
Nonlinear scattering of radio waves by metal objects N84-32049
Amplification of traveling magnetostatic waves by parametric pumping N84-32050
Calculating electric fields in semiconductor structures when singularities are present N84-32051
Electrical characteristics of metal-dielectric-semiconductor systems produced on epitaxial silicon structures with various dielectrics N84-32052
Investigation of Bragg reflection of electromagnetic surface waves by diffraction grating N84-32053
Stability of stationary rotation of cylinder filled with stratified viscous incompressible fluid N84-32054
Formation of coherent structures by acoustical effects in a turbulent wake N84-32055
Transition from laminar to turbulent flow under action of acoustic vibrations N84-32056
Propagation of gas jet in liquid N84-32057
Free oscillations of ideal stratified fluid in container N84-32058
Similarity criteria for spectra of pressure fluctuations in turbulent boundary layer at wall N84-32059
Noncontradictory method of calculating radiation transfer, and problem of shock wave structure N84-32060
Gasdynamic study of model with combustion in shock tunnel N84-32061
Hypersonic three-dimensional flow of radiating gas around wing N84-32062
Hypersonic flow of viscous gas on surface of blunt cone with strong blow-in in blunted region N84-32063
Coefficient of surface friction with turbulent flow in boundary layer N84-32064
Improving energy performance and duty time of production process CW electrical ionization CO2 lasers by using five-component lasing mixtures N84-32065
IRIS pulsing ruby light source N84-32066
New type of dye laser with light-induced distributed feedback N84-32067
Apparatus based on holographic focusing diffraction grating for measurement of diffraction efficiency of three-dimensional image holograms N84-32068
Newly discovered effect of interaction of optical radiation and glass N84-32069
Source of optical pumping for high-resolution spectroscopy with semiconductor laser N84-32070
Experimental study of strong nonlinear-optics effects in liquid crystals N84-32071
Double scattering background in a CW lidar N84-32072
Resonance and edge amplification of an electric field in a plasma resonance layer and acceleration of particles at plasma inhomogeneities N84-32073
Nonlinear dynamics of resonance-type instability in high-density electron beam: Analytical solution N84-32074
Cooling of semiinfinite body under conditions of nonlinear heat transfer at surface N84-32075
Conditions of filtration burning of porous condensed systems with multiple passage of reaction wave N84-32076
Stable method for solving linear programming problem with approximate data N84-32077
Two-phase methods of solving canonical problem of linear programming N84-32078
Economical multiplication of Boolean equations N84-32079
Sequential method of minimizing nonlinear function on simplex N84-32080
USSR report: Physics and mathematics
[JPRS-UPM-84-005] N84-32081
Electromagnetic excitation of sound in metals N84-32082
Influence of exciton movement in magnetic field on luminescence. Indirect forbidden transitions in Ge N84-32083
Electromagnetic effects in strong field of single crystals N84-32084
Nonequilibrium optical and acoustic phonons in semiconductors N84-32085
Investigation of statistical characteristics of random signals in nonlinear medium N84-32086
Oscillations of elastic airplane due to wind gust N84-32087
Supersonic nonsteady flow past flat and axisymmetric pointed bodies N84-32088
Supersonic jet-cavity interaction pulsation N84-32089
Diffusion transfer during near-sonic turbulence N84-32090
Flow structures and their evolution in turbulent shear layer N84-32091
Motion of vortex pair between parallel walls N84-32092
Chemical lasers N84-32093
Study of emission spectrum of tea CO2 lasers with intracavity absorber N84-32094
Experiments in development of powerful dye laser N84-32095
Multifrequency emission from submillimeter lasers N84-32096
Picosecond parametric optical oscillator with amplification of radiation from tunable semiconductor laser N84-32097
Waveguide CO2 laser with 7.5 W power rating N84-32098
Focusers of obliquely incident laser radiation N84-32099
Fiber optic light guides based on polymer coated multicomponent glasses N84-32100
Using information on tangential target motion in space-time signal processing N84-32101
Bremsstrahlung from longitudinal plasma waves produced by subthermal electrons in plasma N84-32102
Energy characteristics of plasma generated in air near target by radiation from CO2 laser N84-32103
Production of dense plasma column in strong magnetic fields and its diagnosis by laser methods N84-32104
Plasma beam instability of bounded electron beam in weak magnetic field N84-32105
Heat transfer by radiation in hydrogen plasma N84-32106
Differential equations for movement of triaxial gyroscopic stabilizer on moving base N84-32107
Propagation of nonlinear compression pulses through granular media N84-32108
Non-integrability of planar oscillation equation for satellite in elliptical orbit N84-32109

K

KANNER (LEO) ASSOCIATES, REDWOOD CITY, CALIF.
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386
KENT STATE UNIV., OHIO.
Automatic finite element generators N84-31695
KENTRON, INC., ARLINGTON, VA.
Accounting utility for determining individual usage of production level software systems
[NASA-CR-172414] N84-31959

L

LABORATORIO DE ACUSTICA E SONICA, SAO PAULO (BRAZIL).
Micrometric cleaning of steel tubes through ultrasonic cavitation
[REPT-61584] N84-32125
Agglomeration and precipitation by sonic-inertial means: Abstract of the state of the art
[REPT-0563/84] N84-32126
LANGUAGE SERVICES, KNOXVILLE, TENN.
Pulsed high-current source of negatively charged hydrogen ions
[DE84-012989] N84-32158
Electromagnetic theory of an antenna for ICR heating of a plasma in Tokamaks
[DE84-012988] N84-32200
LASSEN RESEARCH, MANTON, CALIF.
Research study: Organization and development of organized convection in the boundary layer
[NASA-CR-171115] N84-31552
LENOX INST. FOR RESEARCH, INC., MASS.
A modified standard method for the determination of ozone residual concentration by spectrophotometry
[PB84-204684] N84-31335
LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Angles-only, ground-based, initial orbit determination
[AD-A142994] N84-31241
The discrimination of pitch in pulse trains and speech
[AD-A142996] N84-32127
Solid state research
[AD-A142991] N84-32204
LOCKHEED-CALIFORNIA CO., BURBANK.
Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodied commercial transport aircraft
[NASA-CR-172344] N84-31267
LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
Preliminary engineering report for design of a subscale ejector/diffuser system for high expansion ratio space engine testing
[NASA-CR-171137] N84-31273
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Hydrogen transport, mixing, and combustion studies
[DE84-012455] N84-31317
Chemical kinetics in hydrogen-air flames
[DE84-011002] N84-31323
Properties of polymers: Some uses in electronics, part 1
[DE84-012863] N84-31386
Properties of polymers: Some uses in electronics, part two
[DE84-012864] N84-31387
Disappearance rates of C2(a 3 Pi u) and C2(X 1 Sigma g +) with O2 over the temperature range 298-1300 deg K N84-31405
Lumped-circuit model of four vane RFQ resonator
[DE84-011343] N84-31497
Operational parameters of a 2.0-MeV RFQ linac
[DE84-011366] N84-31498
RFQ simulation code
[DE84-011385] N84-31499
Development of thermionic integrated circuits for applications in hostile environments
[DE84-011374] N84-31533
Energy storage capacitors. Lecture 4: Appendix
[DE84-010040] N84-31546
Heat pipe technology development for high temperature space radiator applications
[DE84-012444] N84-31581
Two-dimensional vapor flow analysis in heat pipes
[DE84-012581] N84-31582
Heat pipe development status
[DE84-012580] N84-31583
Operational performance of the Antares alignment system
[DE84-012659] N84-31632
The effect of finite rotation on a problem in plastic deformation
[DE84-012627] N84-31710
Slideline verification for multilayer pressure vessel and piping analysis including tangential analysis
[DE84-004333] N84-31711
Climatic change and streamflow in the southwest
[DE84-012658] N84-31776
Suprathermal ions upstream of the Earth's bow shock
[DE84-012625] N84-31855
Resonances in electron-molecule scattering and photoionization
[DE84-012660] N84-32139
Metastable complexes of helium-hydrogen isotopes
[DE84-009995] N84-32160
Space reactor fuels performance and development issues
[DE84-011414] N84-32164
Reentry analysis
[DE84-012640] N84-32167
Microstructural stability of copper electroplate
[DE84-010070] N84-32174
High density Z pinch as a small low-energy fusion device
[DE84-009992] N84-32198

Nonthermal effects on the diagnostics of a collapsing gas shell Z-pinch
[DE84-009996] N84-32199
The selective epoxidation of ethylene catalyzed by silver: Mechanistic details revealed by single-crystal studies
[DE84-009997] N84-32215
Theoretical study of cepheid light curves
[DE84-012453] N84-32322

LOUISIANA STATE UNIV., BATON ROUGE.
Geodetic graphs and convexity N84-31729
Solar flares and magnetospheric particles: Investigations based upon the ONR-602 experiment
[AD-A143144] N84-32336

M

MANCHESTER UNIV. (ENGLAND).
A laboratory study of aircraft precipitation static charging
[AD-A142561] N84-31848

MANITOBA UNIV., WINNIPEG.
Phase error effects on the radiation patterns of space-fed planar phased arrays
[AD-P003505] N84-31473
On the quasi-periodic microstrip snake antenna with metal trough backing
[AD-P003510] N84-31478

MANVILLE SERVICE CORP., DENVER, COLO.
Opacification of high temperature fibrous insulation
[NASA-CR-166578] N84-31285

MARCONI AVIONICS LTD., BOREHAM WOOD (ENGLAND).
A code of practice to constrain Ada (Trademark)
[AD-P003559] N84-31163

MARCONI AVIONICS LTD., ROCHESTER (ENGLAND).
Third generation MIL-STD-1553B LSI chip set
[AD-P003542] N84-31146
Options and opportunities for standards: A NATO/AGARD viewpoint
[AD-P003577] N84-31182

MARTIN MARIETTA AEROSPACE, ORLANDO, FLA.
Standards and integrated avionic digital system architecture
[AD-P003561] N84-31166

MARTIN MARIETTA CORP., DENVER, COLO.
Application of TOS/AMS to TDRS E and F
[NASA-CR-171124] N84-31225
Spacecraft servicing demonstration plan
[NASA-CR-171132] N84-31258
Teleoperator human factors study
[NASA-CR-171120] N84-31944

MARYLAND UNIV., COLLEGE PARK.
Fundamental research in applied mathematics
[AD-A143123] N84-32016

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Ion bombardment effects of the fatigue life of stainless steel under simulated fusion first wall conditions
[DE84-001300] N84-31359
Flow in a tapered centrifuge
[DE84-012553] N84-31573
New variational formulations of hybrid stress elements N84-31690
A pioneer deep ocean mining venture
[PB84-199645] N84-31780
The copycat project: An experiment in nondeterminism and creative analogies
[AD-A142744] N84-31990

MASSACHUSETTS UNIV., AMHERST.
A selection principle in Benard-type convection
[NASA-CR-173689] N84-31559
Economic application of assembly robots: Elements of sensor applications to programmable feeders
[PB84-193200] N84-31656
Linear polarization and total flux density of silicon monoxide masers and active extragalactic objects at millimeter wavelengths N84-32314
The kinematics of the emission line gas in quasars and active galactic nuclei N84-32326

MATHEMATISCH CENTRUM, AMSTERDAM (NETHERLANDS).
Abstraction, specification and implementation techniques with an application to garbage collection
[MATH-CENTRE-TRACTS-166] N84-31960
Multiple grid methods for equations of the second kind with applications in fluid mechanics
[MATH-CENTRE-TRACTS-163] N84-32018
Upper bounds for the numbers of solutions of diophantine equations
[MATH-CENTRE-TRACTS-166] N84-32019
On point processes
[MATH-CENTRE-TRACTS-165] N84-32025
Nonnegative matrices in dynamic programming
[MATH-CENTRE-TRACTS-167] N84-32028
On the uniqueness of a regular thin near octagon on 288 vertices (or the semibiplane belonging to the Mathieu group M12)
[MC-ZW-196/83] N84-32029
Some observations concerning the zero-curves of the real and imaginary parts of Riemann's zeta function
[MC-ZW-201/83] N84-32030
An infinite series of symmetric designs
[MC-ZW-202/83] N84-32031

MATRA SERVICE AERODYNAMIQUE, VELIZY-VILLACOUBLAY (FRANCE).
Method for designing future weapons systems: Example of the very short distance ground-air systems N84-31250

MAX-PLANCK-INST. FUER KERNPHYSIK, HEIDELBERG (WEST GERMANY).
The Project STRAFAM: Test of a new parachute based instrument carrier for stratospheric research
[BMFT-FB-W-84-021] N84-31859

MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
A high performance MIL-STD-1750A microprocessor
[AD-P003549] N84-31153

MCDONNELL-DOUGLAS ELECTRONICS CO., ST. CHARLES, MO.
New concepts in aircrew training using computer generated imagery: A study report
[AD-P003451] N84-32228

MCELROY (RALPH) CO., AUSTIN, TEX.
Protective plasma envelope
[DE84-013316] N84-32194
Probing a plasma with high-energy beams of atoms using threshold detectors
[DE84-013360] N84-32195

MECHANICAL TECHNOLOGY, INC., LATHAM, N. Y.
Research study of pressure instrumentation
[NASA-CR-171143] N84-31599
Automotive Stirling engine development program
[NASA-CR-174622] N84-32305

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., HAMBURG (WEST GERMANY).
Feasibility study of a low cost Energy Performance Management System (EPMS)
[BMFT-FB-W-84-015] N84-31116
Unsteady aerodynamics of fast moving control surfaces
[BMFT-FB-W-84-020] N84-31117

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (WEST GERMANY).
Testing of coatings in space, Long Duration Exposure Facility (LDEF)
[BMFT-FB-W-84-017] N84-31269

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., SCHROBENHAUSEN (WEST GERMANY).
Warheads for SAM systems N84-31257

MESSINA UNIV. (ITALY).
Scattering properties of a moving dielectric object
[AD-A142845] N84-31489

METEOROLOGICAL SATELLITE CENTER, TOKYO (JAPAN).
Introduction to Meteorological Satellite Center of Japan Meteorological Agency N84-31864

MIAMI UNIV., CORAL GABLES, FLA.
Holocene sediments and evolution of the Indian River (Atlantic coast of Florida) N84-31730

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Performance and test criteria for dc fuses, phase 1
[PB84-202662] N84-31548

MICHIGAN UNIV., ANN ARBOR.
Effect of crystallization of grain boundary phase on the high temperature strength of silicon nitride ceramics
[DE84-011786] N84-31382

MIDWEST RESEARCH INST., GOLDEN, COLO.
Wind energy: a brief assessment
[DE84-012208] N84-31788
SERI photovoltaics advanced research and development: FY 1983 accomplishments
[DE84-004493] N84-31789
Wind energy systems for electric utilities: A synthesis of value studies
[DE84-004520] N84-31796
Selected bibliography of solar thermal literature. Volume 2: Indexes
[DE84-009363] N84-32288

MIKROS SYSTEMS CORP., MERCERVILLE, N.J.
A new silicon-on-sapphire MIL-STD-1750A microprocessor
[AD-P003551] N84-31155

MILCOM, INC., NEEDHAM, MASS.
Effect of spatial decorrelation on nulling performance of linear adaptive array
[AD-A143013] N84-31570

MILITAIR HOSPITAAL DR. A. MATHIJSEN, UTRECHT (NETHERLANDS).
Ophthalmological investigation among contact lens wearers in military service
[REPT-AR/MHAM-1983-1] N84-31940

MINNESOTA UNIV., ST. PAUL.
Study of variable extinction of hot stars with circumstellar dust shells
[NASA-CR-173644] N84-32315

MISSION RESEARCH CORP., SAN DIEGO, CALIF.
Electron charging and SGEMP (System Generated Electromagnetic Pulse) studies on satellite dielectrics
[AD-A143012] N84-31268

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Analysis of space telescope data collection systems
[NASA-CR-171129] N84-31958

MISSISSIPPI UNIV., UNIVERSITY.
Mie scattering as a technique for the sizing of air bubbles
[AD-A142737] N84-32170

MISSOURI UNIV., ROLLA.
Effects of radiofrequency radiation on differentiation of erythroleukemic cells
[AD-A143038] N84-31914
Calorimetric determination of the thermodynamic behavior of reversible liquid-phase reactions for use in energy storage
[DE84-010437] N84-32218

MITRE CORP., MCLEAN, VA.
Moebius r-2R lens
[AD-P003511] N84-31479

MONRONEY (MIKE) AERONAUTICAL CENTER, OKLAHOMA CITY, OKLA.
Uniform mass distribution properties and body size appropriate for the 50 percentile male aircrewmember, 1960 - 1980
[AD-A142948] N84-31948

MOTOREN- UND TURBINEN-UNION MUENCHEN G.M.B.H. (WEST GERMANY).
Increase of efficiency in cooled high temperature turbines
[BMFT-FB-W-84-019] N84-31212

N

NAGOYA UNIV. (JAPAN).
Electron capture cross sections in high energy He2+ + neutral Li collisions
[IPPJ-679] N84-32182
Proceedings of Collaborating Research Meeting on Particle-Beam Applications to Fusion Research
[IPPJ-678] N84-32184

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Practical applications of a space station
[NASA-CR-173672] N84-31270
Producer gas: Another fuel for motor transport
[DE84-901066] N84-31416
Polar research board report, 1983 and future plans
[PB84-194315] N84-31779
Seismological studies of the continental lithosphere
[PB84-194752] N84-31862
Japan Sea central region tsunami of 26 May 1983. A reconnaissance report
[PB84-194703] N84-31901
An ocean climate research strategy
[PB84-194828] N84-31902
An evaluating report on the Institute for Computer Sciences and Technology, National Bureau of Standards, fiscal year 1983
[PB84-194802] N84-32271

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Earth resources, a continuing bibliography with indexes
[NASA-SP-7041(42)] N84-31725
NASA patent abstracts bibliography, a continuing bibliography. Section 1: Abstracts (Supplement 25)
[NASA-SP-7039(25)-SECT-1] N84-32272
Microgravity Science Applications Bibliography: 1984 revision
[NASA-TM-86651] N84-32283

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Computational aerodynamics and artificial intelligence
[NASA-TM-85994] N84-31089
Development and application of an analysis of axisymmetric body effects on helicopter rotor aerodynamics using modified slender body theory
[NASA-TM-85934] N84-31090
Unsteady transonic aerodynamic and aeroelastic calculations about airfoils and wings
[NASA-TM-85986] N84-31092

Potential application of artificial concepts to aerodynamic simulation
[NASA-TM-85976] N84-31093
Comparison of the full potential and Euler formulations for computing transonic airfoil flows
[NASA-TM-85983] N84-31094
Software modifications to the Demonstration Advanced Avionics Systems (DAAS)
[NASA-TM-85942] N84-31105
Results of the first complete static calibration of the RSRA rotor-load-measurement system
[NASA-TP-2327] N84-31111
Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112
Fuel conservative guidance concept for shipboard landing of powered-lift aircraft
[NASA-TM-85971] N84-31215
Calculation of boundary layers of oscillating airfoils
[NASA-TM-85943] N84-31554
Optical stark effect in the 2-photon spectrum of NO
[NASA-TM-85964] N84-32131
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and Technology Assessment
[NASA-CP-2275-VOL-3] N84-32318
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Introduction N84-32319
Technology Panel reports N84-32320
Large Deployable Reflector Science and Technology Workshop. Volume 3: Systems and technology assessment. Conclusions N84-32321
Studies of low-mass star formation with the large deployable reflector
[NASA-TM-85960] N84-32326

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.

Software control and system configuration management: A systems-wide approach
[NASA-TM-85908] N84-31112

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Geological rhythms and cometary impacts
[NASA-TM-86116] N84-32327

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Radiometric calibration and processing procedure for reflective bands on LANDSAT-4 protoflight Thematic Mapper
[E84-10056] N84-31731
The near-Earth magnetic field at 1980 determined from MAGSAT data
[E84-10170] N84-31733
Characterization of the LANDSAT sensors' spatial responses
[E84-10171] N84-31734
TM digital image products for applications
[E84-10178] N84-31749
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10179] N84-31750
Prelaunch absolute radiometric calibration of the reflective bands on the LANDSAT-4 protoflight Thematic Mapper
[E84-10180] N84-31751
Prelaunch absolute radiometric calibration of LANDSAT-4 protoflight Thematic Mapper
[E84-10181] N84-31752
Characterization of radiometric calibration of LANDSAT-4 TM reflective bands
[E84-10182] N84-31753
TM digital image products for applications
[E84-10183] N84-31754
Spectral characterization of the LANDSAT Thematic Mapper sensors
[E84-10184] N84-31755
Introduction to Thematic Mapper investigations. Section 1: Radiometry. Section 2: Geometry
[E84-10185] N84-31756
Relative radiometric calibration of LANDSAT TM reflective bands
[E84-10186] N84-31757
Age discrimination among basalt flows using digitally enhanced LANDSAT imagery
[E84-10189] N84-31760
Prescription of land-surface boundary conditions in GISS GCM 2: A simple method based on high-resolution vegetation data bases
[NASA-TM-86096] N84-31761
Conservation laws of wave action and potential enstrophy for Rossby waves in a stratified atmosphere
[NASA-TM-86058] N84-31838
A device-dependent interface for interactive image display
[NASA-TM-86136] N84-31949
Pilot climate data system user's guide
[NASA-TM-86064] N84-31956
Large amplitude MHD waves upstream of the Jovian bow shock: Reinterpretation
[NASA-TM-86131] N84-32333
Two probable optical flashes from gamma-ray bursters
[NASA-TM-86126] N84-32337
Photon-photon absorption and the uniqueness of the spectra of active galactic nuclei
[NASA-TM-86117] N84-32338

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.

Fundamental remote science research program. Part 2: Status report of the mathematical pattern recognition and image analysis project
[NASA-TM-58260] N84-31762
Pulmonary artery location during microgravity activity: Potential impact for chest-mounted Doppler during space travel
[NASA-TM-58262] N84-31935

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.

A route generator concept for aircraft onboard fault monitoring
[NASA-TM-86264] N84-31104
Fiber optics for the future - wavelength division multiplexing
[AD-P003579] N84-31184
Effect of external pressure environment on the internal noise level due to a source inside a cylindrical tank
[NASA-TM-85814] N84-31226
Aerothermal loads analysis for high speed flow over a quilted surface configuration
[NASA-TM-86260] N84-31560
Electroless-plating technique for fabricating thin-wall convective heat-transfer models
[NASA-TP-2349] N84-31561
A blackbody-pumped CO2-N2 transfer laser
[NASA-TP-2347] N84-31617
Active controls: A look at analytical methods and associated tools
[NASA-TM-86269] N84-31684
Large deflections of circular isotropic membranes subjected to arbitrary axisymmetric loading
[NASA-TM-86271] N84-31686
A model of asynchronous iterative algorithms for solving large, sparse, linear systems
[NASA-CR-172418] N84-31988
Flux-vector splitting and Runge-Kutta methods for the Euler equations
[NASA-CR-172415] N84-31993
Annoyance caused by propeller airplane flyover noise
[NASA-TP-2356] N84-32124

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Feedback in separated flows over symmetric airfoils
[NASA-TM-83758] N84-31091
Acoustic excitation: A promising new means of controlling shear layers
[NASA-TM-83772] N84-31096
The potential impact of new power system technology on the design of a manned space station
[NASA-TM-83770] N84-31272
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations N84-31280
Calculation of vaporization rates assuming various rate determining steps: Application to the resistojet
[NASA-TM-83757] N84-31283
Application of finite element substructuring to composite micromechanics
[NASA-TM-83729] N84-31288
Overlay coating degradation by simultaneous oxidation and coating/substrate interdiffusion
[NASA-TM-83736] N84-31344
High-temperature cyclic oxidation data, volume 1
[NASA-TM-83665] N84-31345
Failure analysis of plasma-sprayed thermal barrier coatings
[NASA-TM-83777] N84-31347
Evaluation of the effect of crack closure on fatigue crack growth of simulated short cracks
[NASA-TM-83776] N84-31348
Empirical relations for cavitation and liquid impingement erosion processes
[NASA-TP-2339] N84-31349
Adhesion between polymers and evaporated gold and nickel films
[NASA-TP-2360] N84-31379
The 20 and 30 GHz MMIC technology for future space communication antenna system
[NASA-TM-83745] N84-31460
Monolithic microwave integrated circuits: Interconnections and packaging considerations
[NASA-TM-83774] N84-31461
Dual ion beam deposition of carbon films with diamondlike properties
[NASA-TM-83743] N84-31512
The effects of lithium counterdoping on radiation damage and annealing in n(+)p silicon solar cells
[NASA-TM-83755] N84-31513
Deposition of Na2SO4 from salt-seeded combustion gases of a high velocity burner rig
[NASA-TM-83751] N84-31558
Lubrication of machine elements
[NASA-RP-1126] N84-31640
Nonlinear displacement analysis of advanced propeller structures using NASTRAN
[NASA-TM-83737] N84-31683
Cyclic torsion testing
[NASA-TM-83756] N84-31687
Nonlinear Structural Analysis
[NASA-CP-2297] N84-31688
Nonlinear analysis for high-temperature composites: Turbine blades/vanes N84-31699
Photovoltaics: The endless spring
[NASA-TM-83684] N84-31782
Climatology of ozone at altitudes from 19,000 at 59,000 feet based on combined GASP and ozonesonde data
[NASA-TP-2303] N84-31865
Time dependent wave envelope finite difference analysis of sound propagation
[NASA-TM-83744] N84-32118
Analysis of the effect on combustor noise measurements of acoustic waves reflected by the turbine and combustor inlet
[NASA-TM-83760] N84-32122
Preliminary experiments on phase conjugation for flow visualization
[NASA-TM-83766] N84-32169

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Dielectric cure monitoring: Preliminary studies
[NASA-TM-86452] N84-31378
A high voltage electrical power system for low Earth orbit applications
[NASA-TM-86453] N84-31511
Nighttime observations of thunderstorm electrical activity from a high altitude airplane
[NASA-TM-86544] N84-31597
Radial SI latches vibration test data review
[NASA-TM-86454] N84-31638
Testing and evaluation of Vespel up to 450 deg F when used in nuts and bolts as a self-locking element
[NASA-TM-86456] N84-31639

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[NLR-TR-83104-U] N84-31592
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[PB84-182146] N84-31426
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[AD-A142834] N84-32133

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Data word standardization
[AD-P003543] N84-31147
Navy packaging standardization thrusts
[AD-P003564] N84-31169
NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY, BAY ST. LOUIS, MISS.
Deep-Towed Array Geophysical System (DTAGS): A hardware description
[AD-A142970] N84-31851
NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
The KAPSE (Kernel Ada (Trademark) Programming Support Environment) interface team
[AD-P003557] N84-31161
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Superplasticity in thermomechanically processed high magnesium aluminum-magnesium alloys
[AD-A143164] N84-31356
Analysis of modern analog and digital communication channels from a manager's perspective
[AD-A143161] N84-31494
An analytical evaluation of spall suppression of impulsively loaded aluminum panels based on a 1-dimensional stress wave propagation model
[AD-A143173] N84-31708
Large-scale atmosphere-ocean coupling
[AD-A143162] N84-31873
Sources of error in objective analysis
[AD-A142772] N84-32020
A comparison of 2 acoustic parabolic transmission loss models for compatibility with the wavenumber technique in the determination of source depth
[AD-A143079] N84-32128
Cerenkov radiation in the neighborhood of the emission threshold
[AD-A143088] N84-32135
Measurement of LINAC bunch parameters using the Cerenkov effect
[AD-A143128] N84-32136
NAVAL RESEARCH LAB., WASHINGTON, D. C.
Shock-initiated decomposition of nitramines with laser diagnostics N84-31401
Airblast simulations using flux-corrected transport codes
[AD-A142820] N84-31567
Fatigue crack growth behavior of an oxide dispersion strengthened MA956 alloy
[AD-A142059] N84-31702
Longitudinal and transverse instabilities in a high current modified betatron electron accelerator
[AD-A142822] N84-32132
Studies of hydrogenated amorphous silicon
[DE84-011888] N84-32211
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Investigation of parameters influencing the deflection of a thick wall jet by a thin wall jet coflowing over a rounded corner
[AD-A142773] N84-31099
Effect of radial load distribution on the first-harmonic inflow velocity of a helicopter rotor at transition speeds
[AD-A142840] N84-31100
NAVAL TRAINING EQUIPMENT CENTER, ORLANDO, FLA.
Real-time CGSI (Computer Generated Synthesized Imagery)-single pipeline processor
[AD-P003480] N84-32247
VHSIC (Very High Speed Integrated Circuits) for training systems
[AD-P003484] N84-32251
NEBRASKA UNIV., LINCOLN.
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[NASA-CR-173873] N84-32130
NEVADA UNIV., RENO.
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[DE84-012409] N84-31770
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[DE84-012404] N84-31852
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NORD-MICRO ELEKTRONIC FEINMECHANIK G.M.B.H., FRANKFORT (WEST GERMANY).
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[BMFT-FB-W-84-018] N84-31208
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O

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[DE84-012244] N84-31975
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[DE84-012308] N84-31313
OAK RIDGE NATIONAL LAB., TENN.
Improvements in mechanical properties in SiC by the addition of TiC particles
[DE84-012352] N84-31297
Comparative studies of vapor and liquid-phase impregnation of porous silicon nitride and silicon carbide materials
[DE84-012867] N84-31309
Conceptual basis of resonance ionization spectroscopy
[DE84-011662] N84-31318
Historical survey of resonance ionization spectroscopy
[DE84-011654] N84-31319
Isotopically selective counting of noble gas atoms, using resonance ionization spectroscopy
[DE84-011638] N84-31320
Perspective of the corrosive behavior of lithium and sodium
[DE84-011635] N84-31362
Observations on the sliding wear of ceramics
[DE84-012344] N84-31395
Transport properties and dielectric strengths of gas mixtures for use in diffuse discharge opening switches
[DE84-011444] N84-31536
Performance test results of a lithium bromide-water absorption heat pump that uses low-temperature (60 deg C(140 deg F)) waste heat
[DE84-013129] N84-31586
Theory of 4-wave mixing for VUV generation
[DE84-011663] N84-31630
Advanced remotely maintainable force-reflecting servomanipulator concept
[DE84-011634] N84-31646
Basis research on intelligent robotic systems operating in hostile environments: New developments at ORNL
[DE84-011484] N84-31647
Atmospheric retention of anthrogenic CO2: Scenario dependence of the airborne fraction
[DE84-012079] N84-31879
Inventory of numeric data for carbon dioxide research, revision 1
[DE84-013663] N84-31881
Physics of ion sputtering
[DE84-011664] N84-32150
Dual arc penning ion source gas flow experiments
[DE84-011637] N84-32151
Nonlinear analysis of Stirling engine thermodynamics
[DE84-013493] N84-32219
Review of existing environmental and natural resource data bases
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Transfer during sliding wear of selected metal systems N84-31341
Environmentally-controlled crack growth rate of type 304 stainless steel in high temperature sulfate solutions N84-31342
Modeling, control and simulation of three-dimensional robotic systems with application to biped locomotion N84-31943
Research on computer aided testing of pilot response to critical in-flight events
[NASA-CR-173871] N84-31945
A spectrophotometric study of temporal variations in the optical spectrum of SS 433 N84-32312
OLD DOMINION UNIV., NORFOLK, VA.
Graduate engineering research participation in aeronautics
[NASA-CR-173849] N84-32220
OPTICAL COATING LAB., INC., SANTA ROSA, CALIF.
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[DE84-011560] N84-31388
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[DE84-013620] N84-31794

Regional Wind Energy Assessment Program report. Appendix: Wind statistics summaries
[DE84-011835] N84-31876
Regional wind energy assessment program
[DE84-011832] N84-31878

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Analytical characterization of coatings and thin overlayers
[DE84-011902] N84-31389
State of technology of direct contact heat exchanging
[DE84-012824] N84-31585
Holographic investigation of thermal nonequilibrium vapor generation
[DE84-011905] N84-31607
Optical coating materials for the ultraviolet: Selection and characterization
[DE84-011504] N84-31629
Measurement of turbulent wind velocities using a rotating boom apparatus
[DE84-012417] N84-31675
US annual average wind power
[DE84-012215] N84-31677
Algorithm for secondary electron emission from water vapor by high velocity ions
[DE84-011871] N84-32142
PAKISTAN SPACE AND UPPER ATMOSPHERE RESEARCH COMMITTEE, KARACHI.
Space research in Pakistan: A relentless pursuit N84-31227
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Blade endwall flows in an axial flow compressor stage N84-31209
Crystallite size and support effects on CO hydrogenation reactions
[DE84-012474] N84-31314
A space-marching method for the Navier-Stokes equations for internal flows N84-31550
Mathmatical modeling of longitudinal profile adjustment in alluvial streams N84-31726
Petrography and depositional environment of the Herrin (no. 6) seam in central, eastern and northwestern Illinois N84-31813
The depositional environments and petrography of the Stirling Quartzite Death Valley Region, California and Nevada N84-31816
A three-dimensional ray method and its application to the study of wave propagation in crustal structure with curved layers N84-31821
Acoustic propagation in the surface layer under convectively unstable conditions N84-32111
PLYMOUTH POLYTECHNIC (ENGLAND).
The mechanical properties of carbon fibre with glass fibre hybrid reinforced plastics N84-31292
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PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
Stationary state computational fluid dynamics for aero-propulsion devices N84-31278
Three-dimensional stress analysis using the boundary element method N84-31700
PRATT AND WHITNEY AIRCRAFT GROUP, WEST PALM BEACH, FLA.
Behavior of Ni-Cr-Si coating alloys in Na2SO4, V2O5 and mixed salt hot corrosion
[DE84-012386] N84-31383
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[AD-A143100] N84-32023
PRINCETON UNIV., N. J.
Chemical poisoning in model heterogeneous reactions
[DE84-012461] N84-31315
Princeton VLSI project
[AD-A142959] N84-31521
Temperature derivatives of elastic stiffnesses and frequency-temperature behavior of quartz crystal plates N84-31675
Bi- and poly-optimal confidence limits for a location and parameter
[AD-A142960] N84-32012
Strong confidence intervals: A compromise between the Gaussian and the slash
[AD-A142961] N84-32021
The use of double sampling in studying robustness
[AD-A142962] N84-32022
Variance-stable R-estimators
[AD-A143172] N84-32024
The shape of the Sun N84-32334
PROPRIETARY SOFTWARE, INC., LOS ANGELES, CALIF.
Management overview of the benefits of efficient JOVIAL J73/1750A software tools
[AD-P003519] N84-31123
PROPRIETARY SOFTWARE SYSTEMS, INC., BEVERLY HILLS, CALIF.
Planning of operational software implementation tool
[AD-P003595] N84-31200
PURDUE UNIV., LAFAYETTE, IND.
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-173866] N84-31214
Measurement of the absorption coefficient using the sound-intensity technique
[NASA-CR-173848] N84-32115
Study of double wall panels for use in propeller driven aircraft
[NASA-CR-173847] N84-32116
Prediction of light aircraft interior sound pressure level using the room equation
[NASA-CR-173840] N84-32117

R

RAND CORP., SANTA MONICA, CALIF.
Distributed problem solving for air fleet control: Framework and implementations
[AD-A143168] N84-31108
RAYTHEON CO., BEDFORD, MASS.
Wideband microstrip ring radiator
[AD-P003507] N84-31475
RAYTHEON CO., SUDBURY, MASS.
PAS/NEB: A PASCAL language tool for the MCF (Military Computer Family)
[AD-P003535] N84-31139
RAYTHEON CO., WAYLAND, MASS.
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[AD-P003556] N84-31160
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Corrosion fatigue of an Al-Zn-Mg alloy and an Al-Mg-Li alloy N84-31339
Creep-fatigue interactions in advanced eutectic superalloys
[AD-A142872] N84-31705
RICE UNIV., HOUSTON, TEX.
Phase and volumetric studies for methane/synthesis gas separations: The hydrogen-carbon monoxide-methane system
[PB84-214394] N84-31417
The effect of information display format on multiple-cue judgment
[AD-A142884] N84-31941
RIJKSDIENST VOOR DE IJSSELMEERPOLDERS, LELYSTAD (NETHERLANDS).
Long term policy planning concerning Harderbos (Netherlands)
[REPT-178] N84-31777
The use of aquatic plants to purify waste water in recreational waters
[REPT-226] N84-31805
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Mathematical model for a simplified Bridgman-Stockberger crystal growing system
[NASA-CR-171108] N84-32202
ROCHESTER INST. OF TECH., N. Y.
LANDSAT 4 band 6 data evaluation
[E84-10175] N84-31737
ROCHESTER UNIV., N. Y.
The effects of internal stress and phase transformations on fracture N84-31671
A superconducting microwave parametric converter transducer sensitive to 10 to the minus nineteenth power m harmonic motion N84-32112
A new model of Raman spectra in laser produced plasma
[DE84-009825] N84-32188
How useful are odd-integer half-harmonics
[DE84-012392] N84-32190
Optical and infrared polarization as a probe of matter near stars N84-32324
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 2
[NASA-CR-167666] N84-31260
Results of the AFRSI detailed-environment test of the 0.035-scale SSV pressure-loads model 84-0 in the Ames 11x11 ft. TWT and the Lewis 8x6 ft. and 10x10 ft. SWT (OA-310A, B, C), volume 1
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[DE84-011084] N84-31296
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[DE84-013620] N84-31794
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[AD-P003550] N84-31154
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
A general purpose computer architecture investigation facility
[AD-P003573] N84-31178
MIL-STD defense system software development
[AD-P003590] N84-31195
APSE database user scenario
[AD-P003593] N84-31196
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[AD-A142754] N84-31467
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[AD-P003513] N84-31481
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[PREPRINT-372] N84-31591
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Conference Grant for 2nd World Congress on Biomaterials
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S

SAN JOSE STATE UNIV., CALIF.
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[NASA-CR-166597] N84-31284
SANDIA LABS., ALBUQUERQUE, N. MEX.
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[DE84-012035] N84-31311
Sodium compatibility of refractory metal alloy/304L braze joints
[DE84-012877] N84-31364
Enhanced low-temperature performance of a multicell LiSOC1sub2 battery
[DE84-011680] N84-31537
Emerging battery technologies
[DE84-011193] N84-31538
Multicell LiSOCl sub 2 reserve battery
[DE84-012812] N84-31542
New approach to the effective stress principle
[DE84-006963] N84-31574
Lower confidence bounds on system reliability using component data: Maximum methodology
[DE84-012813] N84-31668
A data acquisition and analysis system for fiber creep testing
[DE84-012654] N84-31709
NASTRAN-based computer program for structural dynamic analysis of horizontal axis wind turbine
[DE84-011257] N84-31713
Combined experimental/analytical modeling using component mode synthesis
[DE84-013147] N84-31715
Neutron damage effects in AlGaAs/GaAs solar cells
[DE84-009448] N84-31791
Solar thermal parabolic dish systems: Technology and applications
[DE84-012239] N84-31792

A comparative evaluation of new low-cost array field designs for grid-connected photovoltaic systems
[DE84-010978] N84-31797
APC-2: An electron beam propagation code
[DE84-011532] N84-32144
PIXE and PBFA 2: Pulsed X-ray source feasibility study
[DE84-011535] N84-32155
A multi-GHz multi-channel photonic analog data processing system
[DE84-012281] N84-32175
Radiation effects in optoelectronic devices
[DE84-012889] N84-32176
Current status of calculations and measurements of ion stopping power in ICF plasmas
[DE84-005660] N84-32187
Irradiation of optimized, MBE grown, AlGaAs radiation hardened photodiode
[DE84-006034] N84-32208
Superlattice structures grown by molecular beam epitaxy
[DE84-011288] N84-32209
Technology transfer revisited
[DE84-012233] N84-32293

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[DE84-012408] N84-31606

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[DE84-011177] N84-31412

SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
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[AD-A143171] N84-31306

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[DE84-010843] N84-32189

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[NASA-CR-166594] N84-31219

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The Shock and Vibration Digest, volume 16, no. 4
[AD-A141077] N84-31676
The Shock and Vibration Digest, volume 16, no. 7
[AD-A143958] N84-31679

SINGER CO., BINGHAMTON, N.Y.
A comparison of simulator procurement/program practices: Military versus commercial
[AD-P003453] N84-32230
Effectiveness of multi-year and advance procurement contracts
[AD-P003462] N84-32239
A laser image generation system for helicopter Nap-Of-the-Earth (NOE) flight training
[AD-P003481] N84-32248
Data base management of software development
[AD-P003486] N84-32253
A four-dimensional thunderstorm model for flight simulators
[AD-P003492] N84-32258

SINGER CO., LANCING (ENGLAND).
Digital control loading: A microprocessor-based approach
[AD-P003483] N84-32250

SINGER CO., SUNNYVALE, CALIF.
Image generator architectures and features
[AD-P003449] N84-32226
Low-Altitude Database Development Evaluation and Research (LADDER)
[AD-P003468] N84-32243
Synthetic aperture radar simulation
[AD-P003474] N84-32246

SIPPICAN OCEAN SYSTEMS, INC., MARION, MASS.
Expendable current profiler (XCP, Mod 7)
[AD-A142936] N84-31897

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, LES MUREAUX (FRANCE).
Batteries and accumulators for future Aerospatiale projects
[SNIAS-841-422-111] N84-31282
Combustion of redox mixes in the Through Bulkhead Initiator (TBI) configuration
[SNIAS-841-422-115] N84-31332
Comparison of simulation and measurement techniques for continuous waves and pulses
[SNIAS-841-422-103] N84-31501
A technique for simulating conduction interference created by electromagnetic pulses (EMP)
[SNIAS-841-422-104] N84-31502
Calculation of low altitude electromagnetic pulses in the first moments
[SNIAS-841-422-105] N84-31503
Calculation of high altitude electromagnetic pulses due to X and gamma photons
[SNIAS-841-422-106] N84-31504
Coupling of electromagnetic pulses created by a nuclear explosion on the ground with overhead power cables
[SNIAS-841-422-107] N84-31505
Calculation of electromagnetic fields on the surface of and inside cavities
[SNIAS-841-422-108] N84-31506
Calculation of currents induced in a network of overhead power lines by an electromagnetic impulse
[SNIAS-841-422-109] N84-31507
Test means and methods linked to experiments on systems
[SNIAS-841-422-110] N84-31508
Text processing in the writing of contracts
[SNIAS-841-422-102] N84-32297

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, PARIS (FRANCE).
A new concept for guiding missiles with an application to the ground-air system N84-31253

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, SURESNES (FRANCE).
Modern structure materials: Present situation and evolution perspectives
[SNIAS-841-551-103] N84-31118
Investigation of damage and damage propagation in static and fatigue tests on carbon epoxy composites
[SNIAS-841-551-102] N84-31298
Calorimetric and thermogravimetric analysis applied to industrial polymers
[SNIAS-841-551-101] N84-31399

SOFTECH, INC., WALTHAM, MASS.
The evolution of the JOVIAL/J73 language from definition to use
[AD-P003518] N84-31122
Ada (Trademark) training considerations
[AD-P003560] N84-31184
Ada (trade name) orientation for managers L101 teacher's guide
[AD-A141846] N84-31968
Integrated Computer-Aided Manufacturing (ICAM) architecture. Part 3, Volume 6: Composite information model of 'Manufacture product' (MFG1)
[AD-A143072] N84-31973

SOFTWARE ENGINEERING ASSOCIATES, INC., TORRANCE, CALIF.
Object code optimization in a standard compiler
[AD-P003520] N84-31124

SOHAR, INC., LOS ANGELES, CALIF.
Fault tolerant software modules for SIFT
[NASA-CR-165874] N84-31955

SOLAR ENERGY TECHNOLOGY, INC., BEDFORD, MASS.
Reflector antennas with low sidelobes, low cross polarization, and high aperture efficiency
[NASA-CR-174670] N84-31464

SOLAR THERMAL TEST FACILITIES, ALBUQUERQUE, N. MEX.
Ceramic heat exchanger design methodology
[DE84-010561] N84-31385

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
A new approach to the evaluation of the effects of stress state and interfacial properties on the behavior of advanced metal matrix composites
[AD-A143083] N84-31294

SPERRY UNIVAC, ST. PAUL, MINN.
A programmable bus control interface
[AD-P003536] N84-31140
The Ada (Trademark) run-time environment
[AD-P003558] N84-31182

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes
[PB84-214360] N84-31334
USAFSAM (USAF School of Aerospace Medicine) review and analysis of radiofrequency radiation bioeffects literature
[AD-A142961] N84-31912

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
High power RF klystrons for linear accelerators
[DE84-012074] N84-31527
Using ions to probe the transverse size of a bunch
[DE84-012772] N84-32141
Engineering basis for selection of positron source material
[DE84-011772] N84-32143
Further effects of ions in the arcs
[DE84-011761] N84-32149
Applied chromodynamics
[DE84-009136] N84-32152
Phase and amplitude control system for Stanford Linear Accelerator
[DE84-011773] N84-32156
Acceleration of high charge density electron beams in the SLAC linac
[DE84-012415] N84-32161

STANFORD UNIV., CALIF.
Computation of inviscid transonic flow using flux vector splitting in generalized coordinates N84-31087
Wing design for minimum drag with practical constraints N84-31109
An on-line equivalent system identification scheme for adaptive control N84-31213
Optimal low-thrust transfers to geosynchronous orbit N84-31240
Helium thrustor propulsion system for precise attitude control and drag compensation of the gravity Probe-B satellite N84-31242
Attitude dynamics of the Galileo spacecraft N84-31262
Physical aging and its influence on the reliability of network epoxies and epoxy-matrix composites
[NASA-CR-173870] N84-31289
Determining the number of signals by information theoretic criteria
[AD-A142748] N84-31486
Computer simulation of surface and film processes
[NASA-CR-173682] N84-31682
Element-by-element solution procedures for nonlinear structural analysis N84-31694
Discrimination of iron alteration minerals in remote sensing data N84-31727
Geology, petrology and tectonic significance of the Mesozoic Paleoceanic terranes of the Vizcaino Peninsula, Baja California Sur, Mexico N84-31810
Geology of the Portrerillos District, Atacama, Chile N84-31811
Geology and geochemistry of the Arctic prospect, Ambler District, Alaska N84-31814
Retrogenesis of the Basal Zone of the Stillwater Complex, Montana N84-31818
The petrology and geochemistry of the Yerington Batholith and the Ann-Mason Porphyry Copper Deposit, Western Nevada N84-31828
Pharmacologic counter measures minimizing post-space flight orthostatic intolerance
[NASA-CR-173861] N84-31936
Unified theory and measurements of elastic waves in polycrystalline materials N84-32110
Theory of acoustic speckle N84-32114
Generation and application of finely focused low energy electron beams N84-32129
The user's mental model of an information retrieval system: Effects on performance N84-32275
A physical database design methodology using the property of separability N84-32281
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn N84-32331

STATE UNIV. OF NEW YORK, BINGHAMTON.
Geology of the Gualan and Southern Sierra de las Minas Quadrangles, Guatemala N84-31834
Usual initial and final state effects in quantum chromodynamics
[DE84-010422] N84-32148

SUOMALAINEN TIEDEAKATEMIA, HELSINKI (FINLAND).
Hyperharmonic cones and hyperharmonic morphisms
[ISBN-951-41-0476-5] N84-32027

SYRACUSE UNIV., N. Y.
Computer programs for electromagnetic coupling between a conducting body and an aperture in an infinite conducting plane
[AD-A142875] N84-31491
Solution of some additional electromagnetic problems by the discrete convolution method
[AD-A143056] N84-31493
SYSTEMS AND APPLIED SCIENCES CORP., HAMPTON, VA.
Empirical studies of upper atmospheric species
[NASA-CR-172437] N84-31847
SYSTEMS AND APPLIED SCIENCES CORP., HYATTSVILLE, MD.
User's guide for ERB 7 matrix. Volume 1: Experiment description and quality control report for year 1
[NASA-CR-170619] N84-31960
NIMBUS 7 Earth Radiation Budget (ERB) matrix user's guide. Volume 2: Tape specifications
[NASA-CR-170620] N84-31961
SYSTEMS PRODUCTIVITY AND MANAGEMENT CORP., DAYTON, OHIO.
Microprocessors in aircrew training devices
[AD-P003485] N84-32252

T

TARTAN LABS., INC., PITTSBURGH, PA.
The NEBULA standard computer architecture
[AD-P003532] N84-31136
TECHNICAL INFORMATION CENTER, OAK RIDGE, TENN.
Energy Data Base. Serial titles with ISSN listing
[DE84-003676] N84-32289
Energy Data Base corporate author entries
[DE84-003677] N84-32290
TECHNION RESEARCH AND DEVELOPMENT FOUNDATION LTD., HAIFA (ISRAEL).
Formation of silicide contacts using codeposited refractory metals alloy films
[AD-A142879] N84-31519
TECHNISCHE HOGESCHOOL, EINDHOVEN (NETHERLANDS).
Computation of the fluid-borne noise in hydrostatic systems and ways to decrease it
[BMFT-FB-HA-84-023] N84-31563
TECHNOLOGY DEVELOPMENT OF CALIFORNIA, ARLINGTON, TEX.
System planning tool to measure cost avoidance resulting from independent assessment techniques applied to test program software development
[AD-P003588] N84-31193
TELEDYNE SYSTEMS CO., NORTHRIDGE, CALIF.
The application of standards to the TDY-750 (TIGERSHARK) mission computer
[AD-P003567] N84-31172
TENNESSEE UNIV., KNOXVILLE.
A combined thermodynamic study of nickel-base alloys
[DE84-013487] N84-31368
Automatic camera tracking for remote manipulators
[DE84-011455] N84-31608
Variability of practice and the transfer of training of motor skills
[AD-A142896] N84-31942
TENNESSEE VALLEY AUTHORITY, CHATTANOOGA.
Test and evaluation of the Philips Model PE 1701 and Lester Model 9665 electric vehicle battery chargers
[DE84-901243] N84-31541
TENNESSEE VALLEY AUTHORITY, NORRIS.
A numerical simulation of heat transfer in evaporative cooling towers
[DE84-901142] N84-31580
TEST SYSTEMS, INC., PHOENIX, ARIZ.
MIL-STD-1553: Testing and test equipment
[AD-P003545] N84-31149
TEXAS A&M UNIV., COLLEGE STATION.
A study of a two-frequency NMR maser N84-31615
Environmental impact research program. An implicit, wiggle-free, and accurate upstream finite-difference algorithm for the 1-dimensional transport-diffusion equation
[AD-A143141] N84-31802
Origin and evolution of the West Philippine Basin N84-31820
Convergence tectonics of the Peru Trench: 8 deg S - 15 deg S latitude N84-31824
TEXAS UNIV., AUSTIN.
Stability and convergence of underintegrated finite element approximations N84-31696
Lineaments of Texas: Possible surface expressions of deep-seated phenomena
[DE84-010827] N84-31858
TEXTRON BELL AEROSPACE CO., BUFFALO, N. Y.
Study of high performance alloy electroforming
[NASA-CR-173665] N84-31350
Slave finite elements: The temporal element approach to nonlinear analysis N84-31689
THERMACORE, INC., LANCASTER, PA.
Power flattening techniques for radioisotopic thermoelectric generators
[AD-A142937] N84-31520
THERMO ELECTRON CORP., WALTHAM, MASS.
An RC-1 organic Rankine bottoming cycle for an adiabatic diesel engine
[NASA-CR-168256] N84-32306
THERMO MECHANICAL SYSTEMS CO., CANOGA PARK, CALIF.
Calculation of the 3-D viscous flow at the endwall leading edge region of an axial annular turbine cascade
[NASA-CR-168275] N84-31095
THOMSON-CSF, BAGNEUX (FRANCE).
Advanced technology for SAM systems analysis, synthesis and simulation N84-31249
THOMSON-CSF, MALAKOFF (FRANCE).
Homing head imperfections altering missile guidance N84-31256
TOKYO DENKI UNIV. (JAPAN).
Research Reports of the Faculty of Engineering, no. 31
[DEC/1983/31] N84-32034
Steady state performance of single-phase reaction motor N84-32035
Ion-molecule reactions and plasma parameters of positive column in oxygen glow discharge N84-32036
Nonlinear dynamics in excitable nerve membranes N84-32037
Effect of thermal irradiation from evaporation source to photo-darkening sensitivity of vacuum deposited AgBr film N84-32038
Properties of bubble domains in cholesteric-nematic mixtures N84-32039
Hydrogen-bond energies of dimer formation and UV absorption spectra of mono-methyl substituted 2-pyridones N84-32040
Improvement in quality of silicon-based amorphous films N84-32041
Considerations on deformable ability and ultimate strength of seismic walls. Part 2: About the derivation of a formula on ultimate shearing stress of walls and its applied verification for some experimental results N84-32042
TOLEDO UNIV., OHIO.
Thermal-stress analysis for wood composite blade
[NASA-CR-173830] N84-31685
TORONTO UNIV. (ONTARIO).
Nonstationary oblique-shock-wave reflections in air
[UTIAS-270] N84-31562
Analytical and numerical study of the flow in a shock tube with an area change at the diaphragm section
[UTIAS-TN-255] N84-31563
Response of a plaster-wood room subjected to simulated sonic booms
[UTIAS-276] N84-31701
TOWSON STATE UNIV., MD.
Logical optimization for database uniformization
[NASA-CR-173636] N84-32282
TRACOR, INC., AUSTIN, TEX.
Transportable GPU (General Processor Units) chip set technology for standard computer architectures
[AD-P003553] N84-31157
TRACOR JITCO, INC., ROCKVILLE, MD.
OTS (Office of Toxic Substances) Information Architecture Notebook
[PB84-186655] N84-32301
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
Wall quench and flammability limit effects on exhaust hydrocarbon emission
[DE84-009754] N84-31307
TRW SPACE TECHNOLOGY LABS., REDONDO BEACH, CALIF.
Raman spectroscopy measurements of flame quenching in a duct-type crevice, appendix B
[DE84-009328] N84-31329
TURIN UNIV. (ITALY).
Noise as a public health problem, volume 1
[AD-A142412] N84-31799
Noise as a public health problem, volume 2
[AD-A142413] N84-31800

U

UNITED INDUSTRIES CORP., BELLEVUE, WASH.
Airborne wind measurements at Cape Blanco, Oregon
[DE84-013662] N84-31880
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA (AUSTRIA).
Advance in materials technology: Monitor issue number 1
[PB84-198286] N84-31377
Guidelines for software production in developed countries
[PB84-202795] N84-31986
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Waste heat recovery from adiabatic diesel engines by exhaust-driven Brayton cycles
[NASA-CR-168257] N84-32307
UNIVERSITY OF EASTERN KENTUCKY, RICHMOND.
Study of proton and neutron activation of metal samples in low Earth orbit
[NASA-CR-171113] N84-31763
UNIVERSITY OF SOUTHERN CALIFORNIA, MARINA DEL REY.
Implementation of INTERLISP on the VAX
[AD-A141707] N84-31967
UTAH STATE UNIV., LOGAN.
Water geochemistry of hydrothermal systems, Wood River District, Idaho
[DE84-012190] N84-31769
UTAH UNIV., SALT LAKE CITY.
Results of a detailed gravity survey in the Alamosa area, Alamosa County, Colorado
[DE84-012188] N84-31853
Acoustic propagation in a termally stratfied atmosphere
[NASA-CR-173863] N84-32121

V

VANDERBILT UNIV., NASHVILLE, TENN.
A finite element model for the analysis and optimal design of beams and plates with variable flexural rigidity N84-31668
A statistical classification model for a database system N84-32279
A non-first-normal-form relational database model N84-32280
VEDA, INC., DAYTON, OHIO,
Some management initiatives to improve embedded commercial computer and training device life cycle support
[AD-P003494] N84-32260
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Residual strength of five boron/aluminum laminates with crack-like notches after fatigue loading
[NASA-CR-3815] N84-31290
A shear deformable shell element for laminated composites N84-31691
Direct generation of seismic floor response spectra for classically and nonclassically damped structures
[PB84-191675] N84-31860
Analytical investigation of synchrophasing as a means of reducing aircraft interior noise
[NASA-CR-3823] N84-32123
VIRGINIA UNIV., CHARLOTTESVILLE.
Digital control system for space structural dampers
[NASA-CR-173867] N84-31267
Literature review of tilting pad and turbulent hydrostatic journal bearings for nuclear main coolant pumps N84-31680
The implementation and use of Ada on distributed systems with high reliability requirements
[NASA-CR-173841] N84-31954
VOUGHT CORP., DALLAS, TEX.
Aircraft-store Electrical Interconnection System (AEIS) functional requirements
[AD-P003527] N84-31131
Signal set standardization for the aircraft-store electrical interconnection system
[AD-P003528] N84-31132

W

WASHINGTON STATE DEPT. OF NATURAL RESOURCES, OLYMPIA.
Geological and geothermal investigation of the lower Wind River valley southwestern Washington Cascade Range
[DE84-012545] N84-31771
Complete Bouguer gravity anomaly map, Cascade Mountains, Washington
[DE84-012548] N84-31856
WASHINGTON STATE ENERGY OFFICE, OLYMPIA.
Cost effectiveness of converting to alternative motor vehicle fuels. A technical assistance study for the city of Longview
[DE84-010479] N84-31415

WASHINGTON STATE UNIV., PULLMAN.
Fracto-emission from graphite/epoxy composites
[NASA-CR-173845] N84-31291
Low temperature geothermal resource evaluation of the Moses Lake-Ritzville-Connell area, Washington
[DE84-012505] N84-31773
WATERLOO UNIV. (ONTARIO).
Vibrations and stability of mechanical systems, 3
N84-31681
WEST VIRGINIA UNIV., MORGANTOWN.
Stall delay by boundary layer blowing and/or suction
N84-31686
WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER, BALTIMORE, MD.
The use of computer ISA (Instruction Set Architectures) and software standards at Westinghouse Defense Electronics Center
[AD-P003552] N84-31156
Westinghouse uses USAF-developed standards
[AD-P003572] N84-31177
Analysis of directivity as a function of scan angle for planar arrays of radiating slots
[AD-P003503] N84-31471
Conformal array analysis
[AD-P003504] N84-31472
WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Laser-assisted solar cell metallization processing
[NASA-CR-173675] N84-31619
Wind turbine generator interaction with conventional diesel generators on Block Island, Rhode Island. Volume 2: Data analysis
[NASA-CR-168319] N84-31783
WISCONSIN UNIV., MADISON.
Oscillatory instability in a 2-fluid Benard problem
[AD-A142792] N84-31565
Numerical solution of viscoplastic flow problems by augmented lagrangians
[AD-A142793] N84-31566
Hopf bifurcation in two-component flow
[AD-A142844] N84-31568
Global solutions for the one-dimensional equations of a viscous reactive gas
[AD-A142931] N84-31569
Lidar observations and modeling of atmospheric mixed layer entrainment processes N84-31607
Applications of the AVE-SESAME data sets to mesoscale studies
[NASA-CR-3819] N84-31666
Asymptotic estimates for resolvents of some nonintegrable Volterra kernels
[AD-A141662] N84-31999
Directional convexity and finite optimality conditions
[AD-A141696] N84-32000
Bayesian models for response surfaces, 2: Estimating the response surface
[AD-A142766] N84-32001
Finite dimensional compensators for infinite dimensional systems with unbounded control action
[AD-A142808] N84-32002
Bayesian models for response surfaces. 1: The equivalence of several models and their relationship to smoothing splines
[AD-A142843] N84-32003
On the controlled approximation order from certain spaces of smooth bivariate splines
[AD-A142868] N84-32004
Statistical inference for reliability from stress strength relationships: The normal case
[AD-A142893] N84-32005
Convergence of bivariate cardinal interpolation
[AD-A142894] N84-32006
Weighted inequalities and degenerate elliptic partial differential equations
[AD-A142895] N84-32007
Efficient sequential designs with binary data
[AD-A142904] N84-32008
Globally convergent procedures for solving nonlinear minimization problems
[AD-A142905] N84-32009
Spline approximation for retarded systems and the Riccatti equation
[AD-A142963] N84-32010
The arithmetic of differentiation
[AD-A142964] N84-32011
Assessment of local influence
[AD-A143002] N84-32014
Optically pumped polarized alkali atomic beams and targets
[DE84-012389] N84-32147
A study of the drawing process for optical fibers
[AD-A142930] N84-32171
Disruptive instabilities in a poloidal divertor tokamak
[DE84-013054] N84-32192
Second harmonic electron cyclotron emission studies of Tokapole-2 plasmas
[DE84-013103] N84-32193
Equitable assignment rules
[AD-A142909] N84-32268
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
MAGSAT correlations with geoid anomalies
[E84-10174] N84-31736
WRIGHT AERONAUTICAL CORP., PATERSON, N.J.
Standardized computing system SDS80
[AD-P003585] N84-31190
WYOMING UNIV., LARAMIE.
A 1-dimensional time dependent model of the stratospheric aerosol N84-31808
Depositional environment and petrology of the Medicine Peak Quartzite (early proterozoic), southern Wyoming
N84-31829
Recent eolian activity and paleoclimate fluctuations in the Ferris Lost Soldier Area, South-Central Wyoming
N84-31830

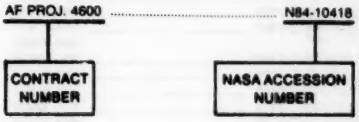
Y

YALE UNIV., NEW HAVEN, CONN.
PLTMGC: A multi-grid continuation program for parameterized nonlinear elliptic systems
[DE84-010406] N84-32017
YAMANASHI UNIV., KOFU (JAPAN).
Relativistic vector sub p x vector sub b acceleration of charged particles by an obliquely propagating electrostatic wave
[IPPJ-680] N84-32183
YLYK LTD., ANN ARBOR, MICH.
High speed low-cost ways to get messages from a sender to a receiver when some channels linking them become inoperative
[AD-A142831] N84-31488

Z

ZEISS (CARL), OBERKOCHEN (WEST GERMANY).
Modular image analysis system
[BMFT-FB-T-84-074] N84-32177
Optimizing tools for generating spherical surfaces and polishing powders in optical production technology
[BMFT-FB-T-84-094] N84-32178

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

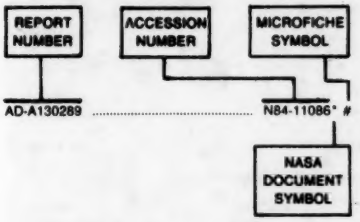
AF PROJ. 649L N84-32204
AF PROJ. 2418 ..... N84-31352
AF PROJ. 2419 ..... N84-31600
AF PROJ. 2729 ..... N84-31308
AF PROJ. 6670 ..... N84-31872
AF-AFOSR-0015-80 ..... N84-31705
AF-AFOSR-0044-80 ..... N84-31353
AF-AFOSR-0096-82 ..... N84-31562
AF-AFOSR-0204-83 ..... N84-31799
N84-31800
AF-AFOSR-0228-83 ..... N84-31486
AF-AFOSR-0323-82 ..... N84-31848
AF-AFOSR-0335-82 ..... N84-31947
ARPA ORDER 4152 ..... N84-31850
ARPA ORDER 4941 ..... N84-31520
A82/K/100 ..... N84-31940
DA PROJ. S99-QAXH N84-31570
DA PROJ. 1L1-61101-AH-45 ..... N84-31095
DA PROJ. 1L1-61102-AH-42 ..... N84-31707
DA PROJ. 1L7-62733-AH-20 ..... N84-31642
DA PROJ. 1T1-61102-BH-57 ..... N84-31489
N84-31519
DA PROJ. 2Q1-61101-B-74-F N84-31942
DA PROJ. 2Q1-62717-A-790 ..... N84-31492
DA PROJ. 2Q2-63731-A-792 ..... N84-31247
DA PROJ. 4A7-62731-AT-41 ..... N84-31971
N84-31972
DAAB07-79-G-6231 ..... N84-31480
DAAB07-83-C-K514 ..... N84-31968
DAAG29-77-G-0003 ..... N84-32016
DAAG29-79-C-0215 ..... N84-31488
DAAG29-80-C-0032 ..... N84-32016
DAAG29-80-C-0041 ..... N84-31565
N84-31566
N84-31568
N84-31569
N84-31999
N84-32000
N84-32001
N84-32002
N84-32003
N84-32004
N84-32005
N84-32006
N84-32007
N84-32008
N84-32009
N84-32010
N84-32011
N84-32014
N84-32171
N84-32268
DAAG29-80-K-0047 ..... N84-31383
DAAG29-81-C-0009 ..... N84-32013
DAAG29-81-K-0021 ..... N84-31970
DAAG29-81-K-0049 ..... N84-31294
DAAG29-81-K-0057 ..... N84-31486
DAAG29-82-K-0029 ..... N84-31568
DAAG29-82-K-0048 ..... N84-31304
DAAG29-82-K-0051 ..... N84-31565
DAAG29-82-K-0069 ..... N84-31569
DAAG29-82-K-0154 ..... N84-32008
DAAG29-82-K-0178 ..... N84-32012
N84-32021
N84-32022
N84-32024
DAAK51-81-C-0047 ..... N84-31095
DAAK80-81-C-0187 ..... N84-31164
DACW39-81-M-0715 ..... N84-31974
DACW39-81-M-4377 ..... N84-31802
DAJA37-81-C-0895 ..... N84-31489
DAJA45-83-C-0013 ..... N84-31519
DAJA45-84-C-0005 ..... N84-31489
DAMD17-84-G-4005 ..... N84-31915
DARPA-29601-80-C-0040 ..... N84-32174
DE-AC02-76CH-00016 ..... N84-31367
N84-31409
N84-31410
N84-31411
N84-31524
N84-31530
N84-31803
N84-31898
N84-32145
N84-32157
N84-32159
DE-AC02-76CH-03000 ..... N84-32140
DE-AC02-76ER-01198 ..... N84-31361
DE-AC02-76ER-02271 ..... N84-32153
DE-AC02-76ER-03166 ..... N84-31360
DE-AC02-76ET-53016 ..... N84-32185
DE-AC02-76ET-53051 ..... N84-32192
DE-AC02-77CH-00178 ..... N84-31788
N84-32268
DE-AC02-77ER-04341 ..... N84-31315
DE-AC02-77ER-04463 ..... N84-31314
DE-AC02-78CS-54936 ..... N84-31641
DE-AC02-78ET-52027 ..... N84-31359
DE-AC02-79ET-27225 ..... N84-31587
DE-AC02-80ER-10619 ..... N84-31392
DE-AC02-81ER-10841 ..... N84-32022
DE-AC02-81ER-10910 ..... N84-31365
DE-AC02-81ER-10996 ..... N84-32017
DE-AC02-81ER-40001 ..... N84-32147
DE-AC02-81ER-60023 ..... N84-31874
DE-AC02-83CH-10093 ..... N84-31789
N84-31795
N84-31796
DE-AC02-83ER-40108 ..... N84-32148
DE-AC03-70SF-00515 ..... N84-32161
DE-AC03-76ET-53057 ..... N84-32189
DE-AC03-76SF-00098 ..... N84-31310
N84-31322
N84-31325
N84-31327
N84-31525
N84-31535
N84-31584
N84-31626
N84-31857
N84-32137
N84-32138
N84-32173
N84-32213
DE-AC03-76SF-00515 ..... N84-31527
N84-32141
N84-32143
N84-32149
N84-32152
N84-32156
DE-AC04-76DP-00613 ..... N84-31602
DE-AC04-76DP-00656 ..... N84-31547
DE-AC04-76DP-00789 ..... N84-31364
N84-31526
N84-31529
N84-31537
N84-31538
N84-31540
N84-31542
N84-31574
N84-31658
N84-31709
N84-31713
N84-31715
N84-31787
N84-31791
N84-31792
N84-31797
N84-32144
N84-32155
N84-32175
N84-32176
N84-32187
N84-32208
N84-32209
N84-32293
DE-AC04-76DP-03533 ..... N84-31296
N84-31794
DE-AC04-76DR-00789 ..... N84-31311
N84-31606
DE-AC04-76ET-13329 ..... N84-31307
N84-31329
DE-AC05-76OR-00033 ..... N84-31975
DE-AC05-79ER-10013 ..... N84-31543
DE-AC05-82OR-20900 ..... N84-31573
DE-AC05-84OR-21400 ..... N84-31297
N84-31318
N84-31319
N84-31320
N84-31362
N84-31395
N84-31536
N84-31586
N84-31608
N84-31630
N84-31647
N84-31879
N84-31881
N84-31978
N84-32150
N84-32151
N84-32158
N84-32200
N84-32219
N84-32292
N84-32296
DE-AC05-84OT-21400 ..... N84-31313
DE-AC05-840R-21400 ..... N84-31648
DE-AC06-76FF-02170 ..... N84-31645
N84-31989
DE-AC06-76RL-01830 ..... N84-31389
N84-31585
N84-31607
N84-31629
N84-31875
N84-31877
N84-32142
DE-AC06-79ET-15322 ..... N84-31363
DE-AC07-76ID-01570 ..... N84-31321
N84-31328
N84-31396
N84-31576
N84-31649
N84-31657
N84-31714
N84-32291
N84-32294
N84-32295
DE-AC07-79ET-27014 ..... N84-31771
N84-31773
N84-31856
DE-AC07-79ID-12079 ..... N84-31769
N84-31853
DE-AC08-80DP-40124 ..... N84-32188
N84-32190
DE-AC08-83NV-10262 ..... N84-31605
N84-31624
DE-AC09-76SR-00001 ..... N84-31648
N84-31977
DE-AC79-82BP-34337 ..... N84-31880
DE-AI01-76ET-20320 ..... N84-31783
DE-AI01-77CS-51040 ..... N84-32305
DE-AI01-77ET-13111 ..... N84-31784
DE-AI01-80CS-50194 ..... N84-32306
DE-AI02-80CS-83116 ..... N84-32211
DE-AM03-76SR-00767 ..... N84-31572
DE-AS05-76ER-05111 ..... N84-31357

DE-AS05-78ER-05051 ..... N84-31366
DE-AS05-78ET-52025 ..... N84-32191
N84-32197
DE-AS05-83FR-45039 ..... N84-31368
DE-AS07-79ID-12057 ..... N84-31858
DE-AT03-78ER-72012 ..... N84-31572
DE-AT03-80ER-52061 ..... N84-32196
DE-AT03-84ER-51044 ..... N84-32186
DE-AT03-80080 ..... N84-32137
DE-FC03-80RA-50075 ..... N84-31770
N84-31852
DE-FC08-80NV-10113 ..... N84-32309
DE-FG03-84CE-50096 ..... N84-31412
DE-FG05-79R0-00003 ..... N84-31415
DE-FG22-83PC-60783 ..... N84-31330
DE-FG22-83PC-60807 ..... N84-31312
DE-FG47-81R7-01250 ..... N84-32218
DEN3-32 ..... N84-32305
DEN3-211 ..... N84-31514
DEN3-257 ..... N84-31784
DEN3-302 ..... N84-32306
DEN3-304 ..... N84-32307
DEN3-954 ..... N84-31783
DI-1-07-81-V-0230 ..... N84-31778
DI-14-08-0001-G-824 ..... N84-31862
DI-14-12-0001-29201 ..... N84-31899
DNA001-79-C-0063 ..... N84-31266
DNA001-82-C-0273 ..... N84-31570
DNA001-83-C-0266 ..... N84-31562
DOT-FA78WAI-693 ..... N84-31865
DRET-81-34-029-00-470-75-01 ..... N84-31299
DTCG-23-80-C-20031 ..... N84-31946
EPA-R-810475 ..... N84-31101
EPA-68-01-6851 ..... N84-32301
EPA-68-02-3487 ..... N84-31333
EPRI PROJ. 1136-18 ..... N84-31541
F04701-83-C-0084 ..... N84-31523
F19628-80-C-0002 ..... N84-31241
N84-32127
F19628-81-C-0067 ..... N84-31487
F19628-82-K-0003 ..... N84-31871
F30602-81-C-0132 ..... N84-31950
F33615-79-C-5100 ..... N84-31210
F33615-80-C-5109 ..... N84-31973
F33615-81-C-0006 ..... N84-32229
F33615-81-C-2070 ..... N84-31522
F33615-82-C-0810 ..... N84-31912
F33615-82-C-1842 ..... N84-31518
F33615-82-C-2242 ..... N84-32023
F33615-82-K-0834 ..... N84-31914
F49620-80-C-0017 ..... N84-32163
F49620-83-C-0160 ..... N84-31488
JPL-956815 ..... N84-31619
MDA903-79-C-0018 ..... N84-31211
MDA903-81-C-0216 ..... N84-31942
MDA903-81-C-0335 ..... N84-31967
MDA903-82-C-0061 ..... N84-31108
MDA903-82-C-0511 ..... N84-31492
MIPR-5-82 ..... N84-31355
MIPR-6-81 ..... N84-31355
MIPR-26-78 ..... N84-31354
N84-31355
MIPR-27-80 ..... N84-31354
N84-31355
NAGW-266 ..... N84-31732
NAGW-455 ..... N84-31739
NAGW-543 ..... N84-32316
NAG1-58 ..... N84-32115
N84-32116
N84-32117
NAG1-157 ..... N84-31214
NAG1-168 ..... N84-32120
NAG1-261 ..... N84-31097
NAG1-283 ..... N84-32121
NAG1-349 ..... N84-31267
N84-31954
NAG1-390 ..... N84-32123
NAG2-112 ..... N84-31945
NAG2-116 ..... N84-31216
NAG2-220 ..... N84-31634
N84-31635
N84-31636
N84-31637
NAG2-278 ..... N84-31559
NAG3-33 ..... N84-31690
NAG3-54 ..... N84-31693
NAG3-147 ..... N84-31280
NAG3-227 ..... N84-31279
NAG3-244 ..... N84-31344
NAG3-298 ..... N84-31695
NAG3-317 ..... N84-31692
NAG3-319 ..... N84-31694
NAG3-329 ..... N84-31696
NAG3-346 ..... N84-31697
NAG3-373 ..... N84-31665
NAG5-190 ..... N84-32315
NAG5-234 ..... N84-31992
NAG5-250 ..... N84-31781
NAG5-267 ..... N84-32282
NAG5-321 ..... N84-31736
NASW-448 ..... N84-31957
NAS1-11621 ..... N84-31267
NAS1-13897 ..... N84-31343
NAS1-15428 ..... N84-31955
NAS1-15759 ..... N84-31217
N84-31218
NAS1-15763 ..... N84-31462
N84-31463
NAS1-15975 ..... N84-31346
NAS1-16000 ..... N84-31959
NAS1-16394 ..... N84-31993
NAS1-16978 ..... N84-32120
NAS1-17070 ..... N84-31988
N84-31993
NAS1-17089 ..... N84-31847
NAS1-17100 ..... N84-31290
NAS1-17130 ..... N84-31988
N84-31993
NAS1-17570 ..... N84-32119
NAS2-11294 ..... N84-31285
NAS2-11555 ..... N84-31962
NAS3-22343 ..... N84-31464
NAS3-23279 ..... N84-31689
NAS3-23684 ..... N84-31595
NAS3-23697 ..... N84-31700
NAS5-27323 ..... N84-31737
NAS5-27554 ..... N84-31735
NAS5-28063 ..... N84-31960
N84-31961
NAS7-100 ..... N84-31619
NAS8-31170 ..... N84-31598
NAS8-31993 ..... N84-31263
N84-31264
N84-31265
NAS8-33570 ..... N84-31958
NAS8-33799 ..... N84-31866
NAS8-33825 ..... N84-31966
NAS8-34679 ..... N84-31594
NAS8-34751 ..... N84-31863
NAS8-34769 ..... N84-31596
NAS8-34773 ..... N84-31552
NAS8-34904 ..... N84-32317
NAS8-35015 ..... N84-31599
NAS8-35051 ..... N84-31273
NAS8-35180 ..... N84-31763
NAS8-35184 ..... N84-31944
NAS8-35342 ..... N84-31266
NAS8-35496 ..... N84-31258
NAS8-35506 ..... N84-31553
NAS8-35594 ..... N84-31459
N84-31835
N84-31836
N84-31837
NAS8-35617 ..... N84-31225
NAS8-35817 ..... N84-31350
NAS8-35916 ..... N84-32168
NAS8-35963 ..... N84-32202
NAS9-16283 ..... N84-31259
N84-31260
NAS9-17200 ..... N84-31935
NA79AA-D-0010 ..... N84-31780
NB82-SBCA-1505 ..... N84-32271
NCA2-OR840-202 ..... N84-31291
NCC2-28 ..... N84-31284
NCC2-103 ..... N84-31289
NCC2-125 ..... N84-31662
NCC2-171 ..... N84-32201
NCC2-232 ..... N84-31936
NCC3-21 ..... N84-31349
NGR-06-002-112 ..... N84-31274
N84-31275
NGR-26-002-021 ..... N84-32130
NGR-47-003-052 ..... N84-32220
NGT-47-020-800 ..... N84-32221
NIVR-1833 ..... N84-31592
NR PROJ. 047624 ..... N84-32267
NR PROJ. 051733 ..... N84-31305
NR PROJ. 051818 ..... N84-32207
NR PROJ. 201484 ..... N84-31938
NR PROJ. 356655 ..... N84-31384
NSF ATM-76-83361 ..... N84-31896
NSF ATM-79-24010 ..... N84-31673
NSF ATM-82-10343 ..... N84-31857
NSF CEE-81-09100 ..... N84-31860
NSF CEE-82-19356 ..... N84-31901
NSF DMR-79-23647 ..... N84-31382
NSF MCS-79-03555 ..... N84-31559
NSF MCS-79-27062 ..... N84-31568
NSF MCS-82-01539 ..... N84-31559
NSF MCS-82-10950 ..... N84-32001
N84-32002
N84-32003
N84-32004
N84-32007
N84-32009
N84-32010
NSF MCS-82-15084 ..... N84-31568
NSF MCS-83-10542 ..... N84-32032
NSF MEA-81-11917 ..... N84-31656
NSF OCE-82-12426 ..... N84-31902
NSG-350 ..... N84-31296
NSG-1595 ..... N84-31616
NSG-5011 ..... N84-31898
NSR-09-012-106 ..... N84-31270
N99-QAXA N84-31567
N00014-76-C-0063 ..... N84-31706
N00014-76-C-0225 ..... N84-31491
N84-31493
N00014-76-C-0302 ..... N84-32015
N00014-77-C-0376 ..... N84-31384
N00014-79-C-0412 ..... N84-31849
N00014-79-C-0524 ..... N84-32206
N00014-79-C-0769 ..... N84-31623
N00014-80-C-0305 ..... N84-31305
N84-32172
N00014-80-C-0505 ..... N84-31990
N00014-80-C-0507 ..... N84-32287
N00014-81-C-0307 ..... N84-32206
N00014-81-K-0136 ..... N84-31938
N00014-81-K-0526 ..... N84-31382
N00014-81-K-0699 ..... N84-31913
N00014-82-C-0001 ..... N84-31941
N00014-82-C-0436 ..... N84-31897
N00014-82-C-0512 ..... N84-32205
N84-32206
N84-32207
N00014-83-C-0034 ..... N84-31650
N00014-83-K-0215 ..... N84-32267
N00014-83-K-0365 ..... N84-32336
N00014-83-K-0498 ..... N84-31382
N84-31621
N00014-84-C-0060 ..... N84-31520
N00014-84-C-0193 ..... N84-32170
N00014-84-F-0005 ..... N84-32133
N00014-84-F-0017 ..... N84-31303
N00014-84-G-0041 ..... N84-31915
N00024-83-C-5301 ..... N84-31276
N84-31400
N84-31490
PROJ. AGRISTARS N84-31735
RR0-0001 ..... N84-32136
RR0-1103 ..... N84-31303
N84-32133
RR0-1107 ..... N84-31623
W-31-109-ENG-38 ..... N84-31324
N84-31369
N84-31385
N84-31414
N84-31531
N84-31539
N84-31544
N84-31545
N84-31577
N84-31579
N84-31603
N84-31772
N84-31774
N84-31775
N84-31790
N84-31793
N84-31804
N84-31882
N84-32154
N84-32165
N84-32210
N84-32214
N84-32216
N84-32306
N84-32329
W-7405-ENG-26 ..... N84-31297
N84-31395
N84-31647
N84-32166
W-7405-ENG-36 ..... N84-31317
N84-31323
N84-31386
N84-31413
N84-31497
N84-31498
N84-31499
N84-31533
N84-31546
N84-31581
N84-31582
N84-31583
N84-31632
N84-31710
N84-31711

	N84-31776
	N84-31855
	N84-32139
	N84-32160
	N84-32164
	N84-32167
	N84-32174
	N84-32198
	N84-32199
	N84-32215
	N84-32322
W-7405-ENG-36	N84-32339
W-7405-ENG-48	N84-31223
	N84-31295
	N84-31296
	N84-31326
	N84-31354
	N84-31358
	N84-31388
	N84-31390
	N84-31391
	N84-31393
	N84-31394
	N84-31496
	N84-31500
	N84-31532
	N84-31534
	N84-31571
	N84-31575
	N84-31578
	N84-31625
	N84-31627
	N84-31628
	N84-31631
	N84-31951
	N84-31952
	N84-31979
	N84-32146
	N84-32194
	N84-32195
W-7405-ENG-82	N84-31316
	N84-32212
W-7405-3NG-82	N84-31712
Y99-QAXS	N84-31567
159-41-01	N84-32328
199-20-96-01	N84-31226
199-99-00-00-72	N84-31935
324-01-00	N84-32119
503-31-83-01	N84-31993
505-04-1A	N84-31558
505-31-3B	N84-31096
	N84-32122
505-31-01	N84-31089
	N84-31092
	N84-31093
505-31-01-01	N84-31094
505-31-32	N84-31554
505-31-38	N84-32118
505-31-42	N84-31595
505-31-53-08	N84-31097
505-31-83-01	N84-31988
505-31-5352	N84-32169
505-33-1A	N84-31345
505-33-5B	N84-31288
505-33-21	N84-31289
	N84-31291
505-33-22	N84-31348
	N84-31687
505-33-33	N84-31686
505-33-43-13	N84-31684
505-33-53-10	N84-31959
505-34-01	N84-31112
505-35-13-04	N84-31104
505-35-13-20	N84-32124
505-36-22	N84-31091
505-40-4K	N84-31095
505-40-32	N84-31865
505-42-11	N84-31090
505-42-51	N84-31216
505-43-43-04	N84-31343
505-55-42	N84-31782
506-51-23-03	N84-31561
506-53-1B	N84-31349
	N84-31379
	N84-31640
506-53-23-05	N84-31290
506-53-31	N84-31285
506-53-53-05	N84-31560
506-55-24	N84-31283
506-55-42	N84-31272
	N84-31513
506-55-72	N84-31512
506-56-73-01	N84-31617
506-58-22	N84-31460
	N84-31461
506-61-81	N84-31636
	N84-31637
506-62-21	N84-32318
506-62-43	N84-31462
506-62-43-01	N84-31463
532-01-11	N84-31105
	N84-31215
532-03-11	N84-31111
532-06-11	N84-31219
533-04-1A	N84-31347
533-04-1E	N84-31344
534-04-13-54	N84-31217
	N84-31218
535-03-12	N84-31683
555-04-1E	N84-31688
691-85-00-00-72	N84-31782
776-33-41	N84-32120
778-14-10	N84-31784
778-34-12	N84-31641

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-9341-VOL-3 ..... N84-32316* #
A-9593 ..... N84-31111* #
A-9599 ..... N84-31554* #
A-9704 ..... N84-31090* #
A-9713 ..... N84-31105* #
A-9754 ..... N84-32328* #
A-9760 ..... N84-32131* #
A-9783 ..... N84-31215* #
A-9798 ..... N84-31093* #
A-9807 ..... N84-31089* #
A-9816 ..... N84-31094* #
A-9822 ..... N84-31092* #

AAC-119-81-4 ..... N84-31948 #

AD-A141077 ..... N84-31676 #
AD-A141409 ..... N84-31620 #
AD-A141450 ..... N84-31485 #
AD-A141456 ..... N84-31300 #
AD-A141634 ..... N84-31564 #
AD-A141662 ..... N84-31999 #
AD-A141689 ..... N84-31351 #
AD-A141696 ..... N84-32000 #
AD-A141707 ..... N84-31967 #
AD-A141713 ..... N84-32285 #
AD-A141848 ..... N84-31968 #
AD-A142059 ..... N84-31702 #
AD-A142065 ..... N84-31486 #
AD-A142066 ..... N84-31352 #
AD-A142078 ..... N84-31113 #
AD-A142084 ..... N84-31786 #
AD-A142412 ..... N84-31799 #
AD-A142413 ..... N84-31800 #
AD-A142561 ..... N84-31848 #
AD-A142649 ..... N84-31518 #
AD-A142674 ..... N84-31703 #
AD-A142690 ..... N84-31871 #
AD-A142737 ..... N84-32170 #
AD-A142738 ..... N84-31764 #
AD-A142739 ..... N84-31210 #
AD-A142744 ..... N84-31990 #
AD-A142746 ..... N84-31765 #
AD-A142748 ..... N84-31486 #
AD-A142752 ..... N84-31098 #
AD-A142753 ..... N84-31114 #
AD-A142754 ..... N84-31467 #
AD-A142764 ..... N84-31766 #
AD-A142767 ..... N84-31849 #
AD-A142768 ..... N84-32001 #
AD-A142772 ..... N84-32020 #
AD-A142773 ..... N84-31099 #
AD-A142774 ..... N84-32223 #
AD-A142775 ..... N84-32266 #
AD-A142776 ..... N84-31121 #
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AFGL-TR-84-0028 ..... N84-31871 #
AFGL-TR-84-0155 ..... N84-31872 #

AFIT/CI/NR-84-27T ..... N84-31098 #
AFIT/CI/NR-84-28T ..... N84-31622 #

AFOSR-84-0515TR ..... N84-31486 #
AFOSR-84-0520TR ..... N84-31947 #
AFOSR-84-0528TR ..... N84-31488 #
AFOSR-84-0530TR ..... N84-31353 #
AFOSR-84-0531TR ..... N84-31705 #
AFOSR-84-0540TR ..... N84-31848 #
AFOSR-84-0544TR ..... N84-32163 #

AFWAL-TR-82-4063-VOL-6 ..... N84-31973 #
AFWAL-TR-83-2079 ..... N84-32023 #
AFWAL-TR-83-2083 ..... N84-31522 #
AFWAL-TR-83-4141 ..... N84-31210 #
AFWAL-TR-84-1021 ..... N84-31518 #
AFWAL-TR-84-4055 ..... N84-31600 #
AFWAL-TR-84-4084 ..... N84-31352 #

AGARD-CAL-84/1 ..... N84-32341 #

AGARD-LS-135 ..... N84-31248 #

AGARD-4-716 ..... N84-31300 #

AI-M-755 ..... N84-31990 #

AMMRC-TR-84-6 ..... N84-31707 #

ANL-OHS/HP-84-102 ..... N84-32165 #

ANL-84-19 ..... N84-31793 #

ANL/EES-TM-247 ..... N84-31772 #

ANL/ER-84-2 ..... N84-31804 #

ANL/ES-134-PT-1 ..... N84-31775 #
ANL/ES-136-PT-2 ..... N84-31774 #

ANL/FE-84-6 ..... N84-31385 #

AR-8 ..... N84-32304 #

ARI-RN-84-102 ..... N84-31247 #

ARI-TR-596 ..... N84-31942 #

ARL/AERO-TM-359 ..... N84-31222 #

ARL/STRUC NOTE-491 ..... N84-31102 #

ARL/STRUC-TM-368 ..... N84-31114 #
ARL/STRUC-TM-370 ..... N84-31293 #
ARL/STRUC-TM-371 ..... N84-31704 #
ARL/STRUC-TM-373 ..... N84-31115 #

ARL/SYS-TM-67 ..... N84-31113 #

ARLCB-TR-84016 ..... N84-31703 #

ARO-14044.9-MA ..... N84-32016 #
ARO-15812.7-MS ..... N84-31354 #
ARO-15812.8-MS ..... N84-31355 #
ARO-16928.8-MA ..... N84-32016 #
ARO-17207.3-MS ..... N84-31294 #
ARO-17224.6-PH ..... N84-31383 #
ARO-17660.4-EL ..... N84-31970 #
ARO-18978.5-CH ..... N84-31304 #
ARO-19442.13-MA ..... N84-32022 #
ARO-19442.14-MA ..... N84-32021 #
ARO-19442.15-MA ..... N84-32012 #
ARO-19442.20-MA ..... N84-32024 #

ASD(ENA)-TR-82-5031-VOL-1 ..... N84-31121 #
ASD(ENA)-TR-82-5031-VOL-2 ..... N84-31185 #
ASD(ENA)-TR-82-5031-VOL-3 ..... N84-31201 #
ASD(ENA)-TR-82-5031-VOL-4 ..... N84-31202 #
ASD(ENA)-TR-82-5031-VOL-5 ..... N84-31203 #
ASD(ENA)-TR-82-5031-VOL-6 ..... N84-31204 #
ASD(ENA)-TR-82-5031-VOL-7 ..... N84-31205 #
ASD(ENA)-TR-82-5031-VOL-8 ..... N84-31206 #
ASD(ENA)-TR-82-5031-VOL-0 ..... N84-31207 #

ASP-355 ..... N84-31896* #

AST-84-1808-VOL-2 ..... N84-31783* #

BBC-RD-1984/3 ..... N84-31454
BBC-RD-1984/5 ..... N84-31455

BBN-5401 ..... N84-31950 #

BLL-CE-TRANS-8002-(9022.09) N84-31336

BLL-M-35595-(5828.4) N84-31337
BLL-M-35604-(5828.4) N84-32273
BLL-M-35605-(5828.4) N84-32222

BLL-WH-592-(9091.9F) N84-31301

BM-OFR-116-84 ..... N84-31548 #

BMFT-FB-HA-84-023 ..... N84-31593 #

BMFT-FB-T-84-074 ..... N84-32177 #
BMFT-FB-T-84-076 ..... N84-31370 #
BMFT-FB-T-84-078 ..... N84-31611 #
BMFT-FB-T-84-094 ..... N84-32178 #
BMFT-FB-T-84-096 ..... N84-31612 #
BMFT-FB-T-84-097 ..... N84-31613 #
BMFT-FB-T-84-098 ..... N84-31633 #
BMFT-FB-T-84-099 ..... N84-31614 #

BMFT-FB-W-84-015 ..... N84-31116 #
BMFT-FB-W-84-016 ..... N84-31798 #
BMFT-FB-W-84-017 ..... N84-31269 #
BMFT-FB-W-84-018 ..... N84-31208 #
BMFT-FB-W-84-019 ..... N84-31212 #
BMFT-FB-W-84-020 ..... N84-31117 #
BMFT-FB-W-84-021 ..... N84-31859 #
BMFT-FB-W-84-023 ..... N84-31610 #

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BNL-34493 ..... N84-31524 #
BNL-34565-REV-1 ..... N84-31603 #
BNL-34642 ..... N84-32217 #
BNL-34653 ..... N84-31898 #
BNL-34706 ..... N84-32145 #
BNL-34728 ..... N84-32159 #
BNL-34778 ..... N84-31367 #

BPA-83-12 ..... N84-31878 #
BPA-83-12-APP ..... N84-31876 #

BRDC-2392 ..... N84-31642 #

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B8342320 ..... N84-32025 #
B8342321 ..... N84-31960 #
B8342322 ..... N84-32028 #
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B8467327 ..... N84-32031 #
B8469009 ..... N84-31777 #
B8469547 ..... N84-31805 #
B84345066 ..... N84-32019 #

CAR-8406 ..... N84-31302 #
CAR-8412 ..... N84-31555 #
CAR-8418 ..... N84-31556 #
CAR-8425 ..... N84-31557 #

CATALYTIC-43790 ..... N84-31784* #

CERL-TR-P-158-VOL-1 ..... N84-31971 #
CERL-TR-P-158-VOL-2 ..... N84-31972 #

CETIM-I.S.13.826 ..... N84-31331 #

CETIM-1.3K.27.3 ..... N84-31423 #
CETIM-1.3K.32.1 ..... N84-31663 #
CETIM-1.3K.36.2 ..... N84-31424 #
CETIM-1.3K.38.2 ..... N84-31983 #
CETIM-1.3N.16.2 ..... N84-31398 #

CETIM-1.3T.042 ..... N84-31991 #
CETIM-1.5C.23.1 ..... N84-31723 #
CETIM-1-4N-090 ..... N84-31422 #
CETIM-5.41.22.0 ..... N84-31609 #
CETIM-5.510.05 ..... N84-31724 #
CETIM-5.580.50 ..... N84-31425 #
CETIM-11-A-102 ..... N84-31716 #
CETIM-11-B-071 ..... N84-31717 #
CETIM-11-B-110 ..... N84-31718 #
CETIM-11-E-360 ..... N84-31719 #
CETIM-11-H-50-9 ..... N84-31961 #
CETIM-11-H-275 ..... N84-31650 #
CETIM-12-D-061 ..... N84-31659 #
CETIM-12-F-360 ..... N84-31371 #
CETIM-12-F-390 ..... N84-31372 #
CETIM-12-F-400 ..... N84-31373 #
CETIM-12-G-284 ..... N84-31374 #
CETIM-12-Y-413 ..... N84-31651 #
CETIM-12-Y-431 ..... N84-31375 #
CETIM-12-Y-442 ..... N84-31652 #
CETIM-13-V-010 ..... N84-31660 #
CETIM-13-Y-322 ..... N84-31653 #
CETIM-14-C-011 ..... N84-31588 #
CETIM-15-H-404 ..... N84-31661 #
CETIM-15-H-417 ..... N84-31662 #
CETIM-41-H-337 ..... N84-31224 #
CETIM-100-14-0 ..... N84-31397 #
CETIM-100-020 ..... N84-31654 #
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CETIM-100730 ..... N84-31720 #
CETIM-100940 ..... N84-31721 #
CETIM-100960 ..... N84-31722 #
CETIM-100980 ..... N84-31962 #

CETS-CND-026 ..... N84-31901 #

CN-46464 ..... N84-31298 #

CONF-011560 ..... N84-31388 #
CONF-830314-7 ..... N84-31496 #
CONF-830354-1 ..... N84-32187 #
CONF-830491-3 ..... N84-31543 #
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CONF-831203-156 ..... N84-31532 #
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CONF-840135-2 ..... N84-31389 #
CONF-840142-8 ..... N84-32138 #
CONF-840145-2 ..... N84-32210 #
CONF-840256-4 ..... N84-31855 #
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CONF-840570-2 ..... N84-32209 #
CONF-840570-3 ..... N84-31790 #
CONF-840577-6 ..... N84-31605 #
CONF-840604-7 ..... N84-32214 #
CONF-840608-1 ..... N84-32308 #
CONF-840612-9-REV-1 ..... N84-31803 #
CONF-840614-27 ..... N84-31579 #
CONF-840616-14 ..... N84-32188 #
CONF-840647-2 ..... N84-31711 #
CONF-840647-14 ..... N84-31578 #
CONF-840662-1 ..... N84-31537 #
CONF-840677-2 ..... N84-31539 #
CONF-840688-1 ..... N84-31571 #
CONF-840702-2 ..... N84-31411 #
CONF-840702-3 ..... N84-31414 #
CONF-840702-4 ..... N84-31410 #
CONF-840702-6 ..... N84-31409 #
CONF-840711-1 ..... N84-31390 #
CONF-840711-3 ..... N84-32174 #
CONF-840712-2 ..... N84-32208 #
CONF-840712-3 ..... N84-31791 #
CONF-840721-1 ..... N84-31574 #
CONF-840725-2 ..... N84-31310 #
CONF-840725-3-SUMM ..... N84-32173 #
CONF-840725-4-SUMM ..... N84-31327 #
CONF-840744-2 ..... N84-31776 #
CONF-840746-1 ..... N84-31710 #
CONF-840801-9 ..... N84-31329 #
CONF-840801-12 ..... N84-31324 #
CONF-840801-13 ..... N84-31322 #
CONF-840804-4 ..... N84-31797 #
CONF-840804-7 ..... N84-32164 #
CONF-840804-14 ..... N84-31545 #
CONF-840804-15 ..... N84-31792 #
CONF-840804-17 ..... N84-31581 #
CONF-840805-2 ..... N84-32215 #
CONF-840805-17 ..... N84-31394 #
CONF-840842-1 ..... N84-32160 #
CONF-840853-3 ..... N84-31544 #
CONF-840979-1 ..... N84-31709 #
CONF-841076-1 ..... N84-31584 #
CONF-8305187-2 ..... N84-32152 #
CONF-8308130 ..... N84-32166 #
CONF-8309118-10 ..... N84-31626 #
CONF-8309212 ..... N84-31369 #
CONF-8309237-1 ..... N84-31898 #
CONF-8310205-7 ..... N84-31657 #
CONF-8310205-10 ..... N84-31367 #
CONF-8310268-2 ..... N84-31712 #
CONF-8403100-1 ..... N84-32199 #
CONF-8403100-3 ..... N84-32198 #
CONF-8403123-1 ..... N84-32142 #
CONF-8403130-1 ..... N84-32159 #
CONF-8404104-3 ..... N84-31575 #
CONF-8404110-3 ..... N84-32216 #
CONF-8404123-2 ..... N84-31533 #
CONF-8404123-3 ..... N84-31607 #
CONF-8404123-5 ..... N84-31714 #
CONF-8404123-6 ..... N84-31649 #
CONF-8404124-5 ..... N84-32175 #
CONF-8404124-7 ..... N84-31632 #
CONF-8404135-3 ..... N84-31321 #
CONF-8404142-1 ..... N84-31538 #
CONF-8404143-3 ..... N84-32151 #
CONF-8404143-5 ..... N84-32140 #
CONF-8404154-1 ..... N84-32146 #
CONF-8404166-1 ..... N84-32213 #
CONF-8405151-2 ..... N84-31977 #
CONF-8405153-1 ..... N84-31713 #
CONF-8405155-1 ..... N84-32339 #
CONF-8405155-2 ..... N84-32329 #
CONF-8405158-1 ..... N84-31629 #
CONF-8405164-2 ..... N84-31317 #
CONF-8405176-1 ..... N84-31395 #
CONF-8405177-1 ..... N84-32139 #
CONF-8405180-1 ..... N84-32322 #
CONF-8405184-1 ..... N84-32293 #
CONF-8406118-1 ..... N84-31989 #
CONF-8406119-2 ..... N84-31542 #
CONF-8406120-1 ..... N84-31577 #
CONF-8406126-1 ..... N84-31645 #
CONF-8406131-1 ..... N84-32167 #
CONF-8406131-2 ..... N84-31582 #
CONF-8406131-3 ..... N84-31583 #
CONF-8406135-1 ..... N84-31658 #
CONF-8406138-1 ..... N84-31393 #

COO-2271-107 ..... N84-32153 #
COO-2456/85 ..... N84-32185 #
COO-3166-34 ..... N84-31360 #

CP-23 ..... N84-31296 #

CPIA-PUBL-400 ..... N84-31400 #
CPIA-PUBL-401 ..... N84-31276 #

CRC-1375 ..... N84-31458

CRIF-MT-159 ..... N84-31655 #

CSDL-P-1915 ..... N84-31957* #

CSDL-R-1725 ..... N84-32317* #

CSIR-TRANS-1718 ..... N84-31420 #
CSIR-TRANS-1719 ..... N84-31421 #
CSIR-TRANS-1723 ..... N84-32203 #
CSIR-TRANS-1724 ..... N84-31841 #
CSIR-TRANS-1725 ..... N84-31380 #
CSIR-TRANS-1726 ..... N84-31842 #
CSIR-TRANS-1728 ..... N84-31418 #
CSIR-TRANS-1731 ..... N84-32284 #
CSIR-TRANS-1734 ..... N84-31419 #

CTR-0748-84003 ..... N84-31641* #

DEC/1983/31 ..... N84-32034 #

DE84-001300 ..... N84-31359 #
DE84-001745 ..... N84-32166 #
DE84-002692 ..... N84-32157 #
DE84-002715 ..... N84-31390 #
DE84-002788 ..... N84-31496 #
DE84-003876 ..... N84-32289 #
DE84-003877 ..... N84-32290 #
DE84-004333 ..... N84-31711 #
DE84-004493 ..... N84-31789 #
DE84-004512 ..... N84-31795 #
DE84-004520 ..... N84-31796 #
DE84-005031 ..... N84-31657 #
DE84-005880 ..... N84-32187 #
DE84-006550 ..... N84-31579 #
DE84-006588 ..... N84-31330 #
DE84-006983 ..... N84-31574 #
DE84-007279 ..... N84-31414 #
DE84-007389 ..... N84-31410 #
DE84-007412 ..... N84-31951 #
DE84-007785 ..... N84-31571 #
DE84-008034 ..... N84-32208 #
DE84-008380 ..... N84-31308 #
DE84-008855 ..... N84-32191 #
DE84-008858 ..... N84-32197 #
DE84-008935 ..... N84-31572 #
DE84-009136 ..... N84-32152 #
DE84-009223 ..... N84-32173 #
DE84-009237 ..... N84-31310 #
DE84-009246 ..... N84-31327 #
DE84-009328 ..... N84-31329 #
DE84-009363 ..... N84-32288 #
DE84-009448 ..... N84-31791 #
DE84-009591 ..... N84-32165 #
DE84-009625 ..... N84-32188 #
DE84-009660 ..... N84-31369 #
DE84-009754 ..... N84-31307 #
DE84-009987 ..... N84-32215 #
DE84-009992 ..... N84-32196 #
DE84-009995 ..... N84-32160 #
DE84-009996 ..... N84-32199 #
DE84-010040 ..... N84-31546 #
DE84-010070 ..... N84-32174 #
DE84-010225 ..... N84-31411 #
DE84-010226 ..... N84-31409 #
DE84-010406 ..... N84-32017 #
DE84-010422 ..... N84-32148 #
DE84-010437 ..... N84-32216 #
DE84-010465 ..... N84-31524 #
DE84-010479 ..... N84-31415 #
DE84-010504 ..... N84-32216 #
DE84-010561 ..... N84-31385 #
DE84-010656 ..... N84-31624 #
DE84-010709 ..... N84-31525 #
DE84-010712 ..... N84-32137 #
DE84-010804 ..... N84-32138 #
DE84-010827 ..... N84-31858 #
DE84-010843 ..... N84-32189 #
DE84-010872 ..... N84-31526 #
DE84-010892 ..... N84-32217 #
DE84-010978 ..... N84-31797 #
DE84-010988 ..... N84-31576 #
DE84-011002 ..... N84-31323 #
DE84-011003 ..... N84-31619* #
DE84-011042 ..... N84-31603 #
DE84-011046 ..... N84-31358 #
DE84-011053 ..... N84-31526 #
DE84-011064 ..... N84-31296 #
DE84-011068 ..... N84-31578 #
DE84-011078 ..... N84-31604 #
DE84-011105 ..... N84-31530 #
DE84-011108 ..... N84-31602 #
DE84-011113 ..... N84-31529 #
DE84-011114 ..... N84-31625 #
DE84-011136 ..... N84-31648 #
DE84-011166 ..... N84-31326 #
DE84-011177 ..... N84-31412 #
DE84-011193 ..... N84-31536 #
DE84-011233 ..... N84-31531 #
DE84-011257 ..... N84-31713 #
DE84-011288 ..... N84-32209 #
DE84-011303 ..... N84-31787 #
DE84-011343 ..... N84-31497 #
DE84-011366 ..... N84-31498 #
DE84-011374 ..... N84-31533 #
DE84-011385 ..... N84-31499 #
DE84-011414 ..... N84-32164 #
DE84-011425 ..... N84-31804 #
DE84-011442 ..... N84-32213 #
DE84-011444 ..... N84-31536 #

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DE84-011455 ..... N84-31608 #
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DE84-011476 ..... N84-31989 #
DE84-011477 ..... N84-32196 #
DE84-011504 ..... N84-31629 #
DE84-011506 ..... N84-31357 #
DE84-011531 ..... N84-31793 #
DE84-011532 ..... N84-32144 #
DE84-011535 ..... N84-32155 #
DE84-011543 ..... N84-31605 #
DE84-011560 ..... N84-31388 #
DE84-011562 ..... N84-31898 #
DE84-011581 ..... N84-31977 #
DE84-011621 ..... N84-31354 #
DE84-011634 ..... N84-31646 #
DE84-011635 ..... N84-31362 #
DE84-011637 ..... N84-32151 #
DE84-011638 ..... N84-31320 #
DE84-011654 ..... N84-31319 #
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DE84-011664 ..... N84-32150 #
DE84-011680 ..... N84-31537 #
DE84-011702 ..... N84-31324 #
DE84-011703 ..... N84-32308 #
DE84-011710 ..... N84-31577 #
DE84-011728 ..... N84-31545 #
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DE84-011761 ..... N84-32149 #
DE84-011772 ..... N84-32143 #
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DE84-011786 ..... N84-31392 #
DE84-011788 ..... N84-32309 #
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DE84-011832 ..... N84-31878 #
DE84-011835 ..... N84-31876 #
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DE84-011854 ..... N84-32153 #
DE84-011871 ..... N84-32142 #
DE84-011888 ..... N84-32211 #
DE84-011895 ..... N84-31674 #
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DE84-012074 ..... N84-31527 #
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DE84-012094 ..... N84-31790 #
DE84-012101 ..... N84-31544 #
DE84-012105 ..... N84-32210 #
DE84-012114 ..... N84-31772 #
DE84-012124 ..... N84-31312 #
DE84-012188 ..... N84-31863 #
DE84-012190 ..... N84-31769 #
DE84-012208 ..... N84-31788 #
DE84-012215 ..... N84-31877 #
DE84-012233 ..... N84-32293 #
DE84-012239 ..... N84-31782 #
DE84-012244 ..... N84-31975 #
DE84-012248 ..... N84-31857 #
DE84-012249 ..... N84-31535 #
DE84-012253 ..... N84-31325 #
DE84-012258 ..... N84-31584 #
DE84-012265 ..... N84-31575 #
DE84-012266 ..... N84-32146 #
DE84-012281 ..... N84-32175 #
DE84-012292 ..... N84-31587 #
DE84-012308 ..... N84-31313 #
DE84-012316 ..... N84-31626 #
DE84-012344 ..... N84-31395 #
DE84-012352 ..... N84-31297 #
DE84-012371 ..... N84-31547 #
DE84-012372 ..... N84-31500 #
DE84-012373 ..... N84-31295 #
DE84-012386 ..... N84-31363 #
DE84-012389 ..... N84-32147 #
DE84-012392 ..... N84-32190 #
DE84-012395 ..... N84-31361 #
DE84-012404 ..... N84-31852 #
DE84-012406 ..... N84-31606 #
DE84-012409 ..... N84-31770 #
DE84-012412 ..... N84-31952 #
DE84-012415 ..... N84-32161 #
DE84-012417 ..... N84-31875 #
DE84-012444 ..... N84-31581 #
DE84-012453 ..... N84-32322 #
DE84-012455 ..... N84-31317 #
DE84-012461 ..... N84-31315 #
DE84-012471 ..... N84-32166 #
DE84-012474 ..... N84-31314 #
DE84-012483 ..... N84-31396 #
DE84-012505 ..... N84-31773 #
DE84-012521 ..... N84-32140 #
DE84-012536 ..... N84-31649 #
DE84-012542 ..... N84-31321 #
DE84-012544 ..... N84-31714 #
DE84-012545 ..... N84-31771 #
DE84-012548 ..... N84-31856 #
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DE84-012576 ..... N84-32269 #
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DE84-012581 ..... N84-31582 #
DE84-012592 ..... N84-31532 #
DE84-012593 ..... N84-31626 #
DE84-012594 ..... N84-31627 #
DE84-012602 ..... N84-31534 #
DE84-012605 ..... N84-31394 #
DE84-012625 ..... N84-31855 #
DE84-012627 ..... N84-31710 #
DE84-012640 ..... N84-32167 #
DE84-012642 ..... N84-32294 #
DE84-012654 ..... N84-31709 #
DE84-012658 ..... N84-31776 #
DE84-012658 ..... N84-32295 #
DE84-012659 ..... N84-31632 #
DE84-012660 ..... N84-32139 #
DE84-012682 ..... N84-31775 #
DE84-012689 ..... N84-31393 #
DE84-012693 ..... N84-32185 #
DE84-012752 ..... N84-31365 #
DE84-012754 ..... N84-31413 #
DE84-012772 ..... N84-32141 #
DE84-012789 ..... N84-32291 #
DE84-012812 ..... N84-31542 #
DE84-012813 ..... N84-31658 #
DE84-012824 ..... N84-31585 #
DE84-012826 ..... N84-31979 #
DE84-012834 ..... N84-31316 #
DE84-012835 ..... N84-32212 #
DE84-012837 ..... N84-31712 #
DE84-012855 ..... N84-31976 #
DE84-012863 ..... N84-31386 #
DE84-012864 ..... N84-31387 #
DE84-012867 ..... N84-31309 #
DE84-012877 ..... N84-31364 #
DE84-012878 ..... N84-31543 #
DE84-012889 ..... N84-32176 #
DE84-012897 ..... N84-31223 #
DE84-012910 ..... N84-32159 #
DE84-012911 ..... N84-31367 #
DE84-012972 ..... N84-31366 #
DE84-012988 ..... N84-32200 #
DE84-012989 ..... N84-32158 #
DE84-013054 ..... N84-32192 #
DE84-013074 ..... N84-31391 #
DE84-013086 ..... N84-31328 #
DE84-013103 ..... N84-32193 #
DE84-013129 ..... N84-31586 #
DE84-013130 ..... N84-32296 #
DE84-013147 ..... N84-31715 #
DE84-013193 ..... N84-31540 #
DE84-013316 ..... N84-32194 #
DE84-013360 ..... N84-32195 #
DE84-013423 ..... N84-32214 #
DE84-013428 ..... N84-31539 #
DE84-013454 ..... N84-31862 #
DE84-013467 ..... N84-31368 #
DE84-013493 ..... N84-32219 #
DE84-013580 ..... N84-31631 #
DE84-013620 ..... N84-31794 #
DE84-013662 ..... N84-31860 #
DE84-013671 ..... N84-31774 #
DE84-013683 ..... N84-31861 #
DE84-900096 ..... N84-31854 #
DE84-901066 ..... N84-31416 #
DE84-901142 ..... N84-31580 #
DE84-901243 ..... N84-31541 #
DMS-DFR-2096 ..... N84-31259* #
DMS-DR-1459-VOL-2 ..... N84-31260* #
DMS-DR-2459-VOL-1 ..... N84-31261* #
DNA-TR-80-003 ..... N84-31766 #
DNA-TR-82-170 ..... N84-31570 #
DNA-6212F ..... N84-31268 #
DOE/BP-211 ..... N84-31878 #
DOE/BP-212-APP ..... N84-31876 #
DOE/BP-257 ..... N84-31860 #
DOE/CE-50036/T2 ..... N84-31412 #
DOE/CH-00178/T20-VOL-2 ..... N84-32288 #
DOE/CH-00178/T21 ..... N84-31788 #
DOE/CS-83116/T1 ..... N84-32211 #
DOE/DP-40124/22 ..... N84-32188 #
DOE/DP-40124/37 ..... N84-32190 #
DOE/EL-01830/T18 ..... N84-31877 #
DOE/ER-01198/1409 ..... N84-31361 #
DOE/ER-02271/107 ..... N84-32153 #
DOE/ER-03166/34 ..... N84-31360 #
DOE/ER-04341/6 ..... N84-31315 #
DOE/ER-04463/7 ..... N84-31314 #
DOE/ER-05111/T1 ..... N84-31357 #
DOE/ER-05951/4 ..... N84-31388 #
DOE/ER-10619/T1 ..... N84-31392 #
DOE/ER-10910/03 ..... N84-31365 #
DOE/ER-40001/T2 ..... N84-32147 #
DOE/ER-40108/1 ..... N84-32148 #
DOE/ER-45039/1 ..... N84-31366 #
DOE/ER-52061/2 ..... N84-32196 #
DOE/ER-60023/T1 ..... N84-31674 #
DOE/ER-72012/T1 ..... N84-31572 #
DOE/ET-13329/T2 ..... N84-31307 #
DOE/ET-15322/T6 ..... N84-31363 #
DOE/ET-27014/T8 ..... N84-31773 #
DOE/ET-27014/T9 ..... N84-31771 #
DOE/ET-27014/T13 ..... N84-31856 #
DOE/ET-53016/T3 ..... N84-32185 #
DOE/ET-53051/63 ..... N84-32192 #
DOE/ET-53051/65 ..... N84-32193 #
DOE/EV-0005/47 ..... N84-32165 #
DOE/ID-12057/T7 ..... N84-31858 #
DOE/ID-12079/107 ..... N84-31769 #
DOE/ID-12079/109 ..... N84-31853 #
DOE/JPL-956615-84/2 ..... N84-31619* #
DOE/MA-0155 ..... N84-32269 #
DOE/NASA-0211-1 ..... N84-31514* #
DOE/NASA-4936/3 ..... N84-31641* #
DOE/NASA/0032-80/7 ..... N84-32305* #
DOE/NASA/0257-1 ..... N84-31784* #
DOE/NASA/0302-1 ..... N84-32306* #
DOE/NASA/0304-1 ..... N84-32307* #
DOE/NASA/0354-2 ..... N84-31783* #
DOE/NV-10113/1 ..... N84-32309 #
DOE/NV-10262/4066 ..... N84-31605 #
DOE/OR-00033/T62 ..... N84-31975 #
DOE/PC-30239/T4 ..... N84-31308 #
DOE/PC-80783/2 ..... N84-31330 #
DOE/PC-80807/3 ..... N84-31312 #
DOE/RA-50075/1 ..... N84-31852 #
DOE/RA-50075/2 ..... N84-31770 #
DOE/R7-01250/T3 ..... N84-32218 #
DOE/TIC-4579-PTS-1/2-REV-13 ..... N84-32289 #
DOE/TIC-4585/R4 ..... N84-32290 #
DOT/FAA/ACS-83-2(19) ..... N84-31103 #
DP-MS-84-40 ..... N84-31977 #
DPST-84-231 ..... N84-31648 #
DTNSRDC/ASED-83/10 ..... N84-31099 #
DTNSRDC/ASED-84/03 ..... N84-31100 #
D4-T1 ..... N84-31570 #
D6-52046 ..... N84-31343* #
E-1499 ..... N84-31345* #
E-1626 ..... N84-31865* #
E-1872 ..... N84-31349* #
E-1903 ..... N84-31688* #
E-1949 ..... N84-31640* #
E-2018 ..... N84-31379* #
E-2063 ..... N84-31348* #
E-2080 ..... N84-31512* #
E-2089 ..... N84-32169* #
E-2121 ..... N84-31782* #
E-2203 ..... N84-31288* #
E-2222 ..... N84-31683* #
E-2223 ..... N84-31344* #
E-2227 ..... N84-31460* #
E-2232 ..... N84-31687* #
E-2233 ..... N84-32118* #

E-2237 ..... N84-31558* #
E-2243 ..... N84-31513* #
E-2244 ..... N84-31283* #
E-2246 ..... N84-31091* #
E-2250 ..... N84-32122* #
E-2261 ..... N84-31272* #
E-2263 ..... N84-31096* #
E-2266 ..... N84-31461* #
E-2269 ..... N84-31347* #

EGG-M-01284 ..... N84-32294 #
EGG-M-01784 ..... N84-32295 #
EGG-M-05283 ..... N84-31857 #
EGG-M-11584 ..... N84-31714 #
EGG-M-11684 ..... N84-31849 #
EGG-M-21683 ..... N84-31321 #

EGG-PBS-6579 ..... N84-31576 #

EGG-SCM-6567 ..... N84-31328 #
EGG-SCM-6577 ..... N84-31306 #

EGG-WM-6627 ..... N84-32291 #

EOARD-TR-84-06-VOL-1 ..... N84-31799 #
EOARD-TR-84-06-VOL-2 ..... N84-31800 #

EPA-IMSD-84-1 ..... N84-32304 #

EPA-560/7-84-001 ..... N84-32301 #
EPA-600/D-84-141 ..... N84-31101 #
EPA-600/D-84-155 ..... N84-31806 #
EPA-600/4-84-033 ..... N84-31333 #

EPOCS/CONTRIB-841 ..... N84-31900 #

EPRI-EA-3466 ..... N84-31879 #

ERC-TR-83024 ..... N84-31514* #

ERL-0285-TR ..... N84-31969 #

ESD-TR-83-223 ..... N84-32204 #
ESD-TR-84-011 ..... N84-31241 #
ESD-TR-84-013 ..... N84-32127 #

ESL-126 ..... N84-31853 #

ESN-38-5 ..... N84-32285 #

ETL-0354 ..... N84-31768 #

E84-10056 ..... N84-31731* #
E84-10169 ..... N84-31732* #
E84-10170 ..... N84-31733* #
E84-10171 ..... N84-31734* #
E84-10172 ..... N84-31735* #
E84-10174 ..... N84-31736* #
E84-10175 ..... N84-31737* #
E84-10176 ..... N84-31738* #
E84-10177 ..... N84-31739* #
E84-10178 ..... N84-31749* #
E84-10179 ..... N84-31750* #
E84-10180 ..... N84-31751* #
E84-10181 ..... N84-31752* #
E84-10182 ..... N84-31753* #
E84-10183 ..... N84-31754* #
E84-10184 ..... N84-31755* #
E84-10185 ..... N84-31756* #
E84-10186 ..... N84-31757* #
E84-10187 ..... N84-31758* #
E84-10188 ..... N84-31759* #
E84-10189 ..... N84-31760* #

FAA-AM-83-16-REV ..... N84-31939 #

FAFSR-10 ..... N84-31287* #

FCM-P1-1984 ..... N84-31884 #
FCM-P12-1984 ..... N84-31888 #

FERMILAB/TM-1261 ..... N84-32140 #

FR-3 ..... N84-31913 #
FR-15738 ..... N84-31383 #
FR-683101-VOL-1 ..... N84-31217* #
FR-683111-VOL-2 ..... N84-31218* #

FSGTR/NT-164 ..... N84-31886 #

FTD-ID(RS)T-0072-84 ..... N84-31786 #
FTD-ID(RS)T-0283-84 ..... N84-31620 #
FTD-ID(RS)T-0284-84 ..... N84-31485 #
FTD-ID(RS)T-0310-84 ..... N84-31564 #
FTD-ID(RS)T-1675-83 ..... N84-31466 #
FTD-ID(RS)T-1735-83 ..... N84-31351 #

FZM-7151 ..... N84-31518 #

GA-A-17528 ..... N84-32186 #

GAO/RCED-84-129 ..... N84-32302 #

GCTG-24 ..... N84-31573 #

GEOFLO/20 ..... N84-31587 #

GEPP-TIS-802 ..... N84-31547 #

GRI-84/0064 ..... N84-31417 #
GRI-84/0092 ..... N84-31334 #

GTFR-44 ..... N84-32197 #
GTFR-46 ..... N84-32191 #

GWU/IMSE/SERIAL-T-485/84 ..... N84-32267 #

H-1256 ..... N84-31112* #

HEDL-SA-3014FP ..... N84-31645 #
HEDL-SA-3128-FP ..... N84-31969 #

HL-84-15 ..... N84-32117* #

HL84-12 ..... N84-32115* #
HL84-13 ..... N84-32116* #

HRL-TR-3 ..... N84-32205 #
HRL-TR-4 ..... N84-32207 #

HUMRRO-FR-TRD(VA)-83-7 ..... N84-31492 #

IAE-372/8 ..... N84-32200 #

ICASE-84-27 ..... N84-31993* #
ICASE-84-34 ..... N84-31988* #

IDA-D-22 ..... N84-31211 #

IDA/HQ-83-25969 ..... N84-31211 #

IITRI-M06054-48 ..... N84-31210 #

INPE-3038-PRE/469 ..... N84-31839 #
INPE-3116-PRE/512 ..... N84-31844 #
INPE-3136-PRE/527 ..... N84-31843 #
INPE-3139-PRE/528 ..... N84-31846 #
INPE-3143-PRE/529 ..... N84-31845 #
INPE-3145-PRE/530 ..... N84-31738* #
INPE-3160-PRE/534 ..... N84-31994 #
INPE-3168-PRE/538 ..... N84-31998 #
INPE-3170-PRE/540 ..... N84-31965 #
INPE-3171-PRE/541 ..... N84-31516 #
INPE-3172-PRE/542 ..... N84-31964 #
INPE-3177-PRE/544 ..... N84-31515 #
INPE-3180-PRE/545 ..... N84-31106 #
INPE-3181-PRE/546 ..... N84-31996 #
INPE-3182-PRE/547 ..... N84-31997 #
INPE-3183-PRE/548 ..... N84-31995 #
INPE-3184-PRE/549 ..... N84-31245 #
INPE-3185-PRE/550 ..... N84-31246 #
INPE-3186-PRE/551 ..... N84-31243 #
INPE-3187-PRE/552 ..... N84-31983 #
INPE-3191-PRE/555 ..... N84-31517 #
INPE-3192-PRE/556 ..... N84-32181 #
INPE-3193-PRE/557 ..... N84-31618 #
INPE-3194-PRE/558 ..... N84-31870 #
INPE-3196-PRE/560 ..... N84-31869 #
INPE-3200-PRE/562 ..... N84-31271* #
INPE-3205-PRE/563 ..... N84-31840 #
INPE-3206-PRE/564 ..... N84-31244 #
INPE-3207-PRE/565 ..... N84-31868 #
INPE-3214-PRE/567 ..... N84-31867 #
INPE-3221-RPE/461 ..... N84-31785 #

IPPJ-678 ..... N84-32184 #
IPPJ-679 ..... N84-32182 #
IPPJ-680 ..... N84-32183 #

IR-AL-032 ..... N84-31966* #

IS-M-465 ..... N84-31712 #
IS-M-466 ..... N84-32212 #
IS-M-469 ..... N84-31316 #

ISBN-0-7968-3029-8 ..... N84-32340 #
ISBN-0-947767-01-0 ..... N84-31555 #
ISBN-0-947767-02-9 ..... N84-31302 #
ISBN-0-947767-10-X ..... N84-31557 #
ISBN-0-947767-15-0 ..... N84-31556 #
ISBN-90-6196-260-9 ..... N84-32018 #
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ISBN-90-6196-265-X ..... N84-32019 #
ISBN-92-835-0353-6 ..... N84-31248 #
ISBN-92-835-0356-2 ..... N84-32341 #
ISBN-92-835-1466-1 ..... N84-31300 #
ISBN-951-41-0476-5 ..... N84-32027

ISI/RS-84-129 ..... N84-31967 #

ISSN-0009-8434 ..... N84-32286 #
ISSN-0062-5255 ..... N84-31562 #
ISSN-0062-5255 ..... N84-31701 #
ISSN-0062-5263 ..... N84-31563 #
ISSN-0170-1339 ..... N84-31116 #
ISSN-0170-1339 ..... N84-31117 #
ISSN-0170-1339 ..... N84-31212 #
ISSN-0170-1339 ..... N84-31289 #
ISSN-0170-1339 ..... N84-31610 #
ISSN-0170-1339 ..... N84-31798 #
ISSN-0170-1339 ..... N84-31859 #
ISSN-0171-7618 ..... N84-31593 #
ISSN-0340-7608 ..... N84-31208 #
ISSN-0340-7608 ..... N84-31370 #
ISSN-0340-7608 ..... N84-31611 #
ISSN-0340-7608 ..... N84-31612 #
ISSN-0340-7608 ..... N84-31613 #
ISSN-0340-7608 ..... N84-31614 #
ISSN-0340-7608 ..... N84-31633 #
ISSN-0340-7608 ..... N84-32177 #
ISSN-0340-7608 ..... N84-32178 #
ISSN-0355-0087 ..... N84-32027
ISSN-0370-8454 ..... N84-32340 #
ISSN-0389-617X ..... N84-32034 #
ISSN-0800-4412 ..... N84-31937 #

JHU/APL/TG-1345 ..... N84-31490 #

JPRS-UBB-84-012 ..... N84-31916 #
JPRS-UBB-84-017 ..... N84-31924 #

JPRS-UEE-84-008 ..... N84-31427 #

JPRS-UNE-84-001 ..... N84-31903 #

JPRS-UPM-84-003 ..... N84-32043 #
JPRS-UPM-84-005 ..... N84-32061 #

JPRS-USP-84-004 ..... N84-31226 #

JPRS-UTR-84-024 ..... N84-31119 #

JW-FR-2-AFOSR ..... N84-31353 #

K/PS-773 ..... N84-31313 #

KORD-14 ..... N84-32290 #

L-15753 ..... N84-31617* #
L-15796 ..... N84-32124* #
L-15815 ..... N84-31561* #

LA-TR-84-14-PT-1 ..... N84-31386 #
LA-TR-84-15-PT-2 ..... N84-31387 #

LA-UR-79-1044-APP ..... N84-31548 #
LA-UR-83-3514 ..... N84-31711 #
LA-UR-84-877 ..... N84-32174 #
LA-UR-84-1041 ..... N84-32215 #
LA-UR-84-1075 ..... N84-32196 #
LA-UR-84-1077 ..... N84-32199 #
LA-UR-84-1088 ..... N84-32160 #
LA-UR-84-1185 ..... N84-31533 #
LA-UR-84-1189 ..... N84-31587 #
LA-UR-84-1277 ..... N84-31498 #
LA-UR-84-1342 ..... N84-31497 #
LA-UR-84-1343 ..... N84-31499 #
LA-UR-84-1381 ..... N84-32164 #
LA-UR-84-1415 ..... N84-31632 #
LA-UR-84-1415 ..... N84-31776 #
LA-UR-84-1424 ..... N84-32139 #
LA-UR-84-1492 ..... N84-31710 #
LA-UR-84-1504 ..... N84-31855 #
LA-UR-84-1559 ..... N84-32167 #
LA-UR-84-1640 ..... N84-32322 #
LA-UR-84-1649 ..... N84-31317 #
LA-UR-84-1673 ..... N84-31581 #
LA-UR-84-1704 ..... N84-31583 #
LA-UR-84-1705 ..... N84-31582 #

LA-10019-MS ..... N84-31323 #

LBL-17293 ..... N84-32173 #
LBL-17294-SUMM ..... N84-31327 #
LBL-17390 ..... N84-31310 #
LBL-17397 ..... N84-31525 #
LBL-17472 ..... N84-32137 #

LBL-17561 ..... N84-32138 #
LBL-17623 ..... N84-31325 #
LBL-17666 ..... N84-31322 #
LBL-17670 ..... N84-32213 #
LBL-17734 ..... N84-31584 #
LBL-17741 ..... N84-31535 #
LBL-17775 ..... N84-31626 #
LBL-17782 ..... N84-31857 #

LIR/08-83/1 ..... N84-31335 #

LMSC-HREC-TR-D951414 ..... N84-31273* #

MATH-CENTRE-TRACTS-163 ..... N84-32018 #
MATH-CENTRE-TRACTS-165 ..... N84-32025 #
MATH-CENTRE-TRACTS-166 ..... N84-31980 #
MATH-CENTRE-TRACTS-167 ..... N84-32028 #
MATH-CENTRE-TRACTS-168 ..... N84-32019 #

MC-ZW-196/83 ..... N84-32029 #
MC-ZW-201/83 ..... N84-32030 #
MC-ZW-202/83 ..... N84-32031 #

MCR-83-607 ..... N84-31944* #
MCR-84-1666 ..... N84-31258* #
MCR-84-2140 ..... N84-31225* #

MITSG-83-14 ..... N84-31780 #

MMS/AT/ES-84/13 ..... N84-31899 #

MPR-7 ..... N84-31266* #
MPR-8 ..... N84-31594* #
MPR-10 ..... N84-31596* #
MPR-19 ..... N84-31552* #

MRC-TSR-2654 ..... N84-31999 #
MRC-TSR-2664 ..... N84-32000 #
MRC-TSR-2680 ..... N84-32010 #
MRC-TSR-2681 ..... N84-31565 #
MRC-TSR-2682 ..... N84-32003 #
MRC-TSR-2683 ..... N84-32001 #
MRC-TSR-2684 ..... N84-32002 #
MRC-TSR-2685 ..... N84-32268 #
MRC-TSR-2686 ..... N84-32006 #
MRC-TSR-2688 ..... N84-32011 #
MRC-TSR-2689 ..... N84-31568 #
MRC-TSR-2690 ..... N84-31566 #
MRC-TSR-2691 ..... N84-32007 #
MRC-TSR-2692 ..... N84-32008 #
MRC-TSR-2693 ..... N84-32171 #
MRC-TSR-2694 ..... N84-32014 #
MRC-TSR-2695 ..... N84-32005 #
MRC-TSR-2696 ..... N84-32004 #
MRC-TSR-2697 ..... N84-31569 #
MRC-TSR-2699 ..... N84-32009 #

MRC/SD-R-112 ..... N84-31268 #

MSSA04-SYS-R001 ..... N84-31850 #

MTI-84TR35 ..... N84-31599* #

MTPN-6 ..... N84-31350* #

NAS 1.15:58260 ..... N84-31762* #
NAS 1.15:58262 ..... N84-31935* #
NAS 1.15:83665 ..... N84-31345* #
NAS 1.15:83684 ..... N84-31782* #
NAS 1.15:83729 ..... N84-31288* #
NAS 1.15:83737 ..... N84-31683* #
NAS 1.15:83738 ..... N84-31344* #
NAS 1.15:83743 ..... N84-31512* #
NAS 1.15:83744 ..... N84-32118* #
NAS 1.15:83745 ..... N84-31480* #
NAS 1.15:83751 ..... N84-31558* #
NAS 1.15:83755 ..... N84-31513* #
NAS 1.15:83756 ..... N84-31687* #
NAS 1.15:83757 ..... N84-31283* #
NAS 1.15:83758 ..... N84-31091* #
NAS 1.15:83760 ..... N84-32122* #
NAS 1.15:83766 ..... N84-32169* #
NAS 1.15:83770 ..... N84-31272* #
NAS 1.15:83772 ..... N84-31096* #
NAS 1.15:83774 ..... N84-31461* #
NAS 1.15:83777 ..... N84-31347* #
NAS 1.15:83778 ..... N84-31348* #
NAS 1.15:85597 ..... N84-31731* #
NAS 1.15:85598 ..... N84-31749* #
NAS 1.15:85599 ..... N84-31750* #
NAS 1.15:85600 ..... N84-31751* #
NAS 1.15:85601 ..... N84-31752* #
NAS 1.15:85602 ..... N84-31753* #
NAS 1.15:85620 ..... N84-31754* #
NAS 1.15:85621 ..... N84-31755* #
NAS 1.15:85622 ..... N84-31756* #

NAS 1.15:85623 ..... N84-31737* #
NAS 1.15:85906 ..... N84-31112* #
NAS 1.15:85934 ..... N84-31090* #
NAS 1.15:85942 ..... N84-31105* #
NAS 1.15:85943 ..... N84-31554* #
NAS 1.15:85960 ..... N84-32328* #
NAS 1.15:85964 ..... N84-32131* #
NAS 1.15:85971 ..... N84-31215* #
NAS 1.15:85976 ..... N84-31093* #
NAS 1.15:85983 ..... N84-31094* #
NAS 1.15:85986 ..... N84-31092* #
NAS 1.15:85994 ..... N84-31089* #
NAS 1.15:86058 ..... N84-31838* #
NAS 1.15:86084 ..... N84-31956* #
NAS 1.15:86096 ..... N84-31761* #
NAS 1.15:86116 ..... N84-32327* #
NAS 1.15:86117 ..... N84-32338* #
NAS 1.15:86126 ..... N84-32337* #
NAS 1.15:86130 ..... N84-31734* #
NAS 1.15:86131 ..... N84-32333* #
NAS 1.15:86133 ..... N84-31733* #
NAS 1.15:86136 ..... N84-31949* #
NAS 1.15:86141 ..... N84-31760* #
NAS 1.15:86264 ..... N84-31104* #
NAS 1.15:86269 ..... N84-31684* #
NAS 1.15:86271 ..... N84-31686* #
NAS 1.15:86280 ..... N84-31560* #
NAS 1.15:86452 ..... N84-31378* #
NAS 1.15:86453 ..... N84-31511* #
NAS 1.15:86454 ..... N84-31638* #
NAS 1.15:86456 ..... N84-31639* #
NAS 1.15:86544 ..... N84-31597* #
NAS 1.15:86651 ..... N84-32283* #
NAS 1.21:7039(25)-SECT-1 ..... N84-32272*
NAS 1.21:7041(42) N84-31725*
NAS 1.26:3809 ..... N84-31097* #
NAS 1.26:3810 ..... N84-31732* #
NAS 1.26:3815 ..... N84-31290* #
NAS 1.26:3819 ..... N84-31866* #
NAS 1.26:3822 ..... N84-31216* #
NAS 1.26:3823 ..... N84-32123* #
NAS 1.26:3828 ..... N84-31217* #
NAS 1.26:3829 ..... N84-31218* #
NAS 1.26:85814 ..... N84-31226* #
NAS 1.26:161231 ..... N84-31264* #
NAS 1.26:161590 ..... N84-31263* #
NAS 1.26:161927 ..... N84-31265* #
NAS 1.26:165874 ..... N84-31955* #
NAS 1.26:166578 ..... N84-31285* #
NAS 1.26:166581 ..... N84-31962* #
NAS 1.26:166589 ..... N84-31637* #
NAS 1.26:166589-PT-1 ..... N84-31634* #
NAS 1.26:166589-PT-2 ..... N84-31635* #
NAS 1.26:166589-PT-3 ..... N84-31636* #
NAS 1.26:166593 ..... N84-32201* #
NAS 1.26:166594 ..... N84-31219* #
NAS 1.26:166597 ..... N84-31284* #
NAS 1.26:167685 ..... N84-31261* #
NAS 1.26:167686 ..... N84-31260* #
NAS 1.26:168135 ..... N84-31784* #
NAS 1.26:168244 ..... N84-31514* #
NAS 1.26:168256 ..... N84-32306* #
NAS 1.26:168257 ..... N84-32307* #
NAS 1.26:168275 ..... N84-31095* #
NAS 1.26:168286 ..... N84-31641* #
NAS 1.26:168319 ..... N84-31783* #
NAS 1.26:170619 ..... N84-31960* #
NAS 1.26:170620 ..... N84-31961* #
NAS 1.26:171108 ..... N84-32202* #
NAS 1.26:171109 ..... N84-31863* #
NAS 1.26:171113 ..... N84-31763* #
NAS 1.26:171114 ..... N84-31553* #
NAS 1.26:171115 ..... N84-31552* #
NAS 1.26:171116 ..... N84-31836* #
NAS 1.26:171117 ..... N84-31835* #
NAS 1.26:171120 ..... N84-31944* #
NAS 1.26:171121 ..... N84-31266* #
NAS 1.26:171122 ..... N84-31594* #
NAS 1.26:171124 ..... N84-31225* #
NAS 1.26:171127 ..... N84-31837* #
NAS 1.26:171129 ..... N84-31958* #
NAS 1.26:171130 ..... N84-31459* #
NAS 1.26:171132 ..... N84-31258* #
NAS 1.26:171133 ..... N84-32168* #
NAS 1.26:171137 ..... N84-31273* #
NAS 1.26:171138 ..... N84-31966* #
NAS 1.26:171140 ..... N84-32317* #
NAS 1.26:171142 ..... N84-31598* #
NAS 1.26:171143 ..... N84-31599* #
NAS 1.26:172344 ..... N84-31267* #
NAS 1.26:172371 ..... N84-31343* #
NAS 1.26:172381 ..... N84-32119* #
NAS 1.26:172392 ..... N84-31346* #
NAS 1.26:172409 ..... N84-32221* #
NAS 1.26:172412 ..... N84-31463* #
NAS 1.26:172413 ..... N84-31462* #

NAS 1.26:172414 ..... N84-31959* #
NAS 1.26:172415 ..... N84-31993* #
NAS 1.26:172418 ..... N84-31988* #
NAS 1.26:172427 ..... N84-32120* #
NAS 1.26:172437 ..... N84-31847* #
NAS 1.26:173672 ..... N84-31270* #
NAS 1.26:173673 ..... N84-31271* #
NAS 1.26:173682 ..... N84-31682* #
NAS 1.26:173830 ..... N84-31685* #
NAS 1.26:173836 ..... N84-32282* #
NAS 1.26:173837 ..... N84-31992* #
NAS 1.26:173839 ..... N84-31957* #
NAS 1.26:173840 ..... N84-32117* #
NAS 1.26:173841 ..... N84-31954* #
NAS 1.26:173844 ..... N84-32315* #
NAS 1.26:173845 ..... N84-31291* #
NAS 1.26:173846 ..... N84-31616* #
NAS 1.26:173847 ..... N84-32116* #
NAS 1.26:173848 ..... N84-32115* #
NAS 1.26:173849 ..... N84-32220* #
NAS 1.26:173853 ..... N84-31736* #
NAS 1.26:173854 ..... N84-31737* #
NAS 1.26:173855 ..... N84-31738* #
NAS 1.26:173856 ..... N84-31739* #
NAS 1.26:173860 ..... N84-31596* #
NAS 1.26:173861 ..... N84-31936* #
NAS 1.26:173862 ..... N84-31259* #
NAS 1.26:173863 ..... N84-32121* #
NAS 1.26:173864 ..... N84-32316* #
NAS 1.26:173865 ..... N84-31350* #
NAS 1.26:173866 ..... N84-31214* #
NAS 1.26:173867 ..... N84-31267* #
NAS 1.26:173869 ..... N84-31559* #
NAS 1.26:173870 ..... N84-31289* #
NAS 1.26:173871 ..... N84-31945* #
NAS 1.26:173873 ..... N84-32130* #
NAS 1.26:173874 ..... N84-31896* #
NAS 1.26:173875 ..... N84-31619* #
NAS 1.26:173882 ..... N84-31758* #
NAS 1.26:173883 ..... N84-31759* #
NAS 1.26:174622 ..... N84-32305* #
NAS 1.26:174636 ..... N84-31595* #
NAS 1.26:174670 ..... N84-31464* #
NAS 1.26:174671 ..... N84-31274* #
NAS 1.26:174704 ..... N84-31275* #
NAS 1.26:175270 ..... N84-31735* #
NAS 1.55:2275-VOL-3 ..... N84-32318* #
NAS 1.55:2297 ..... N84-31688* #
NAS 1.60:2303 ..... N84-31865* #
NAS 1.60:2327 ..... N84-31111* #
NAS 1.60:2339 ..... N84-31349* #
NAS 1.60:2347 ..... N84-31617* #
NAS 1.60:2349 ..... N84-31561* #
NAS 1.60:2356 ..... N84-32124* #
NAS 1.60:2360 ..... N84-31379* #
NAS 1.61:1109 ..... N84-32330*
NAS 1.61:1126 ..... N84-31640* #

NASA-CP-2275-VOL-3 ..... N84-32318* #
NASA-CP-2297 ..... N84-31688* #

NASA-CR-3809 ..... N84-31097* #
NASA-CR-3810 ..... N84-31732* #
NASA-CR-3815 ..... N84-31290* #
NASA-CR-3819 ..... N84-31866* #
NASA-CR-3822 ..... N84-31216* #
NASA-CR-3823 ..... N84-32123* #
NASA-CR-3828 ..... N84-31217* #
NASA-CR-3829 ..... N84-31218* #
NASA-CR-161231 ..... N84-31264* #
NASA-CR-161590 ..... N84-31263* #
NASA-CR-161927 ..... N84-31265* #
NASA-CR-165874 ..... N84-31955* #
NASA-CR-166578 ..... N84-31285* #
NASA-CR-166581 ..... N84-31962* #
NASA-CR-166589 ..... N84-31637* #
NASA-CR-166589-PT-1 ..... N84-31634* #
NASA-CR-166589-PT-2 ..... N84-31635* #
NASA-CR-166589-PT-3 ..... N84-31636* #
NASA-CR-166593 ..... N84-32201* #
NASA-CR-166594 ..... N84-31219* #
NASA-CR-166597 ..... N84-31284* #
NASA-CR-167685 ..... N84-31261* #
NASA-CR-167686 ..... N84-31260* #
NASA-CR-168135 ..... N84-31784* #
NASA-CR-168244 ..... N84-31514* #
NASA-CR-168256 ..... N84-32306* #
NASA-CR-168257 ..... N84-32307* #
NASA-CR-168275 ..... N84-31095* #
NASA-CR-168286 ..... N84-31641* #
NASA-CR-168319 ..... N84-31783* #
NASA-CR-170619 ..... N84-31960* #
NASA-CR-170620 ..... N84-31961* #
NASA-CR-171108 ..... N84-32202* #
NASA-CR-171109 ..... N84-31863* #
NASA-CR-171113 ..... N84-31763* #

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NASA-CR-171115 ..... N84-31552* #
NASA-CR-171116 ..... N84-31836* #
NASA-CR-171117 ..... N84-31835* #
NASA-CR-171120 ..... N84-31944* #
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NASA-CR-171122 ..... N84-31594* #
NASA-CR-171124 ..... N84-31225* #
NASA-CR-171127 ..... N84-31837* #
NASA-CR-171129 ..... N84-31958* #
NASA-CR-171130 ..... N84-31459* #
NASA-CR-171132 ..... N84-31258* #
NASA-CR-171133 ..... N84-32168* #
NASA-CR-171137 ..... N84-31273* #
NASA-CR-171138 ..... N84-31966* #
NASA-CR-171140 ..... N84-32317* #
NASA-CR-171142 ..... N84-31598* #
NASA-CR-171143 ..... N84-31599* #
NASA-CR-172344 ..... N84-31287* #
NASA-CR-172371 ..... N84-31343* #
NASA-CR-172381 ..... N84-32119* #
NASA-CR-172392 ..... N84-31346* #
NASA-CR-172409 ..... N84-32221* #
NASA-CR-172412 ..... N84-31463* #
NASA-CR-172413 ..... N84-31462* #
NASA-CR-172414 ..... N84-31959* #
NASA-CR-172415 ..... N84-31993* #
NASA-CR-172418 ..... N84-31988* #
NASA-CR-172427 ..... N84-32120* #
NASA-CR-172437 ..... N84-31847* #
NASA-CR-173672 ..... N84-31270* #
NASA-CR-173673 ..... N84-31271* #
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NASA-CR-173830 ..... N84-31685* #
NASA-CR-173836 ..... N84-32282* #
NASA-CR-173837 ..... N84-31992* #
NASA-CR-173839 ..... N84-31957* #
NASA-CR-173840 ..... N84-32117* #
NASA-CR-173841 ..... N84-31954* #
NASA-CR-173844 ..... N84-32315* #
NASA-CR-173845 ..... N84-31291* #
NASA-CR-173846 ..... N84-31616* #
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NASA-CR-173848 ..... N84-32115* #
NASA-CR-173849 ..... N84-32220* #
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NASA-CR-173854 ..... N84-31737* #
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NASA-CR-173856 ..... N84-31739* #
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NASA-CR-173861 ..... N84-31936* #
NASA-CR-173862 ..... N84-31259* #
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NASA-CR-173864 ..... N84-32316* #
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NASA-CR-173866 ..... N84-31214* #
NASA-CR-173867 ..... N84-31267* #
NASA-CR-173869 ..... N84-31559* #
NASA-CR-173870 ..... N84-31269* #
NASA-CR-173871 ..... N84-31945* #
NASA-CR-173873 ..... N84-32130* #
NASA-CR-173874 ..... N84-31896* #
NASA-CR-173875 ..... N84-31619* #
NASA-CR-173882 ..... N84-31758* #
NASA-CR-173883 ..... N84-31759* #
NASA-CR-174622 ..... N84-32305* #
NASA-CR-174636 ..... N84-31595* #
NASA-CR-174670 ..... N84-31464* #
NASA-CR-174671 ..... N84-31274* #
NASA-CR-174704 ..... N84-31275* #
NASA-CR-175270 ..... N84-31735* #

NASA-RP-1109 ..... N84-32330*
NASA-RP-1126 ..... N84-31640* #

NASA-SP-7039(25)-SECT-1 ..... N84-32272*
NASA-SP-7041(42) N84-31725*

NASA-TM-58260 ..... N84-31762* #
NASA-TM-58262 ..... N84-31935* #
NASA-TM-83665 ..... N84-31345* #
NASA-TM-83684 ..... N84-31782* #
NASA-TM-83729 ..... N84-31288* #
NASA-TM-83737 ..... N84-31683* #
NASA-TM-83738 ..... N84-31344* #
NASA-TM-83743 ..... N84-31512* #
NASA-TM-83744 ..... N84-32118* #
NASA-TM-83745 ..... N84-31460* #
NASA-TM-83751 ..... N84-31558* #
NASA-TM-83755 ..... N84-31513* #
NASA-TM-83756 ..... N84-31687* #
NASA-TM-83757 ..... N84-31283* #
NASA-TM-83758 ..... N84-31091* #
NASA-TM-83760 ..... N84-32122* #
NASA-TM-83766 ..... N84-32169* #
NASA-TM-83770 ..... N84-31272* #
NASA-TM-83772 ..... N84-31096* #
NASA-TM-83774 ..... N84-31461* #
NASA-TM-83777 ..... N84-31347* #
NASA-TM-83778 ..... N84-31348* #
NASA-TM-85597 ..... N84-31731* #
NASA-TM-85598 ..... N84-31749* #
NASA-TM-85599 ..... N84-31750* #
NASA-TM-85600 ..... N84-31751* #
NASA-TM-85601 ..... N84-31752* #
NASA-TM-85602 ..... N84-31753* #
NASA-TM-85620 ..... N84-31754* #
NASA-TM-85621 ..... N84-31755* #
NASA-TM-85622 ..... N84-31756* #
NASA-TM-85623 ..... N84-31757* #
NASA-TM-85814 ..... N84-31226* #
NASA-TM-85908 ..... N84-31112* #
NASA-TM-85934 ..... N84-31090* #
NASA-TM-85942 ..... N84-31105* #
NASA-TM-85943 ..... N84-31554* #
NASA-TM-85960 ..... N84-32328* #
NASA-TM-85964 ..... N84-32131* #
NASA-TM-85971 ..... N84-31215* #
NASA-TM-85976 ..... N84-31093* #
NASA-TM-85983 ..... N84-31094* #
NASA-TM-85986 ..... N84-31092* #
NASA-TM-85994 ..... N84-31089* #
NASA-TM-86058 ..... N84-31838* #
NASA-TM-86084 ..... N84-31956* #
NASA-TM-86096 ..... N84-31761* #
NASA-TM-86116 ..... N84-32327* #
NASA-TM-86117 ..... N84-32338* #
NASA-TM-86126 ..... N84-32337* #
NASA-TM-86130 ..... N84-31734* #
NASA-TM-86131 ..... N84-32333* #
NASA-TM-86133 ..... N84-31733* #
NASA-TM-86136 ..... N84-31949* #
NASA-TM-86141 ..... N84-31760* #
NASA-TM-86264 ..... N84-31104* #
NASA-TM-86269 ..... N84-31684* #
NASA-TM-86271 ..... N84-31686* #
NASA-TM-86280 ..... N84-31560* #
NASA-TM-86452 ..... N84-31378* #
NASA-TM-86453 ..... N84-31511* #
NASA-TM-86454 ..... N84-31638* #
NASA-TM-86456 ..... N84-31639* #
NASA-TM-86544 ..... N84-31597* #
NASA-TM-86651 ..... N84-32283* #

NASA-TP-2303 ..... N84-31865* #
NASA-TP-2327 ..... N84-31111* #
NASA-TP-2339 ..... N84-31349* #
NASA-TP-2347 ..... N84-31617* #
NASA-TP-2349 ..... N84-31561* #
NASA-TP-2356 ..... N84-32124* #
NASA-TP-2360 ..... N84-31379* #

NBSIR-83-1691 ..... N84-32179 #
NBSIR-84-2816 ..... N84-31426 #

NCAR/CT-81 ..... N84-31885 #

NCAR/TN-230 ..... N84-31891 #

NDRE/PUBL-84-1001 ..... N84-31937 #

NLM-MED-84-02 ..... N84-32300 #

NLR-MP-83026-U ..... N84-31984 #

NLR-TR-83104-U ..... N84-31592 #

NOAA-NWS-ERCP-21 ..... N84-31985 #

NOAA-TM-ERL-PMEL-51 ..... N84-31895 #

NOAA-TM-NOS-NGS-39 ..... N84-31987 #

NOAA-TM-NWS-ER-67 ..... N84-31887 #

NOAA-TM-34L-PMEL-54 ..... N84-31890 #

NOAA-TR-NOS-NGS-29 ..... N84-31861 #

NOAA-84041305 ..... N84-32299 #
NOAA-84041801 ..... N84-31883 #
NOAA-84041906 ..... N84-31884 #
NOAA-84043013 ..... N84-31892 #
NOAA-84050701 ..... N84-31900 #
NOAA-84051002 ..... N84-31893 #
NOAA-84051701 ..... N84-31894 #
NOAA-84051702 ..... N84-31895 #
NOAA-84052201 ..... N84-31987 #
NOAA-84052404 ..... N84-31888 #
NOAA-84052406 ..... N84-31780 #
NOAA-84060106 ..... N84-31887 #
NOAA-84060403 ..... N84-31889 #
NOAA-84060405 ..... N84-31881 #
NOAA-84061105 ..... N84-31890 #
NOAA-84061108 ..... N84-31985 #

NOAA/TR/NESDIS-8 ..... N84-31900 #

NORDA-71 ..... N84-31851 #

NP-4901066 ..... N84-31416 #

NPS53-84-0003 ..... N84-32020 #
NPS61-84-007 ..... N84-32135 #
NPS61-84-008 ..... N84-32136 #
NPS63-84-004 ..... N84-31873 #

NRL-MR-4688 ..... N84-32132 #
NRL-MR-5334 ..... N84-31567 #

NSF-83-67 ..... N84-32270 #

NSF/MEA-84003 ..... N84-31656 #

NSS-SS-RP014-VOL-1-PT-1/2 ..... N84-31263* #
NSS-SS-RP014-VOL-2-BK-1-PT-1/2 ..... N84-31265* #
NSS-SS-RP016-VOL-2 ..... N84-31264* #

NTIA/REPT-84-146 ..... N84-31978 #

NU-SML-TR-84-2 ..... N84-31706 #

OPEN-FILE-83-5 ..... N84-31771 #

ORNL-TR-5117 ..... N84-31309 #
ORNL-TR-5126 ..... N84-32156 #
ORNL-TR-5130 ..... N84-32200 #

ORNL/CDIC-1/R1-REV-1 ..... N84-31881 #

ORNL/CON-154 ..... N84-32219 #

ORNL/TM-8928 ..... N84-32292 #
ORNL/TM-9072 ..... N84-31586 #
ORNL/TM-9232 ..... N84-32296 #

OTA-BP-STI-25 ..... N84-32310 #

PB84-160126 ..... N84-32303 #
PB84-180161 ..... N84-32310 #
PB84-181841 ..... N84-31883 #
PB84-181882 ..... N84-31333 #
PB84-182146 ..... N84-31426 #
PB84-182328 ..... N84-32298 #
PB84-182732 ..... N84-31884 #
PB84-186360 ..... N84-32299 #
PB84-186808 ..... N84-32300 #
PB84-187855 ..... N84-31899 #
PB84-188655 ..... N84-32301 #
PB84-189158 ..... N84-32302 #
PB84-189323 ..... N84-31892 #
PB84-190487 ..... N84-31900 #
PB84-191675 ..... N84-31860 #
PB84-192202 ..... N84-32179 #
PB84-192418 ..... N84-31893 #
PB84-192855 ..... N84-31894 #
PB84-193200 ..... N84-31656 #
PB84-193226 ..... N84-32270 #
PB84-194273 ..... N84-31101 #
PB84-194315 ..... N84-31779 #
PB84-194703 ..... N84-31901 #
PB84-194745 ..... N84-31896 #
PB84-194752 ..... N84-31862 #
PB84-194794 ..... N84-31270* #
PB84-194802 ..... N84-32271 #
PB84-194828 ..... N84-31902 #
PB84-194877 ..... N84-32304 #
PB84-196268 ..... N84-31377 #
PB84-196435 ..... N84-31885 #
PB84-196492 ..... N84-31897 #
PB84-197011 ..... N84-31886 #
PB84-198753 ..... N84-31887 #
PB84-198811 ..... N84-31861 #
PB84-198837 ..... N84-31888 #
PB84-199603 ..... N84-31889 #
PB84-199645 ..... N84-31780 #
PB84-201680 ..... N84-31906 #
PB84-202233 ..... N84-31978 #
PB84-202662 ..... N84-31548 #
PB84-202704 ..... N84-31778 #
PB84-202795 ..... N84-31986 #
PB84-204551 ..... N84-31985 #
PB84-204684 ..... N84-31335 #
PB84-205434 ..... N84-31890 #
PB84-206911 ..... N84-31891 #
PB84-214360 ..... N84-31334 #
PB84-214394 ..... N84-31417 #

PERIODIC-2 ..... N84-31469 #

PNL-SA-11788 ..... N84-32142 #
PNL-SA-11861 ..... N84-31389 #
PNL-SA-12197 ..... N84-31607 #
PNL-SA-12218 ..... N84-31629 #

PNL-4868 ..... N84-31875 #
PNL-5008 ..... N84-31585 #

PREPRINT-83-77 ..... N84-32194 #
PREPRINT-372 ..... N84-31591 #

PRI-76 ..... N84-32189 #

PWA/GPD-FR-17579 ..... N84-32023 #

QR-7 ..... N84-31737* #

R-1 ..... N84-31656 #
R-1385 ..... N84-31897 #

RADC-TR-83-254 ..... N84-31950 #
RADC-TR-84-52-VOL-2 ..... N84-31467 #
RADC-TR-84-80 ..... N84-31487 #

RAI-84-B-4 ..... N84-32202* #

RAND/N-2139-ARPA ..... N84-31108 #

REPT-AR/MHAM-1983-1 ..... N84-31940 #

REPT-4 ..... N84-31912 #
REPT-83-PT-2 ..... N84-32032 #
REPT-84ASE369SA5 ..... N84-32305* #
REPT-95 ..... N84-31623 #
REPT-129 ..... N84-31849 #
REPT-178 ..... N84-31777 #
REPT-226 ..... N84-31805 #
REPT-0226-9 ..... N84-32115* #
REPT-0226-10 ..... N84-32116* #
REPT-0226-12 ..... N84-32117* #
REPT-0563/84 ..... N84-32126 #
REPT-1080-35 ..... N84-31973 #
REPT-1983-4 ..... N84-32204 #
REPT-6519 ..... N84-31487 #
REPT-6318 ..... N84-31880 #
REPT-8404-1 ..... N84-31219* #
REPT-11816 ..... N84-31346* #
REPT-61584 ..... N84-32125 #

RFP-3463 ..... N84-31296 #
RFP-3678 ..... N84-31794 #

S-536 ..... N84-31762* #
S-538 ..... N84-31935* #

SAI-84-3032 ..... N84-32188 #
SAI-84/1142 ..... N84-31863* #

SAND-83-0663C ..... N84-32187 #
SAND-83-0838 ..... N84-32155 #
SAND-83-1519 ..... N84-32187 #
SAND-83-1660 ..... N84-31715 #
SAND-83-2273C ..... N84-31542 #
SAND-83-8043 ..... N84-31606 #
SAND-84-0053C ..... N84-31797 #
SAND-84-0064C ..... N84-31574 #
SAND-84-0111C ..... N84-32209 #
SAND-84-0117 ..... N84-32144 #
SAND-84-0520C ..... N84-31537 #
SAND-84-0525C ..... N84-32208 #
SAND-84-0565C ..... N84-31709 #
SAND-84-0579C ..... N84-31791 #
SAND-84-0632C ..... N84-31792 #
SAND-84-0684C ..... N84-31538 #
SAND-84-0708 ..... N84-31364 #
SAND-84-0771 ..... N84-32176 #
SAND-84-0924C ..... N84-31713 #
SAND-84-1029C ..... N84-32175 #
SAND-84-1063C ..... N84-32293 #
SAND-84-1199C ..... N84-31658 #
SAND-84-7108 ..... N84-31540 #
SAND-84-8220 ..... N84-31311 #

SAR-4 ..... N84-32121* #

SD-TR-84-15 ..... N84-31523 #

SERI/PR-211-2236 ..... N84-31789 #

SERI/STR-211-2277 ..... N84-31795 #

SERI/TR-211-2318 ..... N84-31796 #

SNIAS-841-422-102 ..... N84-32297 #

SNIAS-841-422-103 ..... N84-31501 #
SNIAS-841-422-104 ..... N84-31502 #
SNIAS-841-422-105 ..... N84-31503 #
SNIAS-841-422-106 ..... N84-31504 #
SNIAS-841-422-107 ..... N84-31505 #
SNIAS-841-422-108 ..... N84-31506 #
SNIAS-841-422-109 ..... N84-31507 #
SNIAS-841-422-110 ..... N84-31508 #
SNIAS-841-422-111 ..... N84-31282 #
SNIAS-841-422-115 ..... N84-31332 #
SNIAS-841-551-101 ..... N84-31399 #
SNIAS-841-551-102 ..... N84-31298 #
SNIAS-841-551-103 ..... N84-31118 #

SR-10 ..... N84-31572 #

SU-DMS-84-R-2 ..... N84-31682* #

SU-SLAC-CN-243 ..... N84-32149 #
SU-SLAC-CN-249 ..... N84-32156 #
SU-SLAC-CN-250 ..... N84-32143 #

SU-SLAC-PUB-3283 ..... N84-32152 #
SU-SLAC-PUB-3284 ..... N84-32161 #
SU-SLAC-PUB-3324 ..... N84-31527 #

SU-SLAC/AP-24 ..... N84-32141 #

SYRU/DECE/TR-84/3 ..... N84-31493 #
SYRU/DECE/TR-84/4 ..... N84-31491 #

TDCK-78996 ..... N84-31940 #

TE4322-251-83 ..... N84-32306* #

TR-1 ..... N84-31362 #
TR-1-84 ..... N84-32170 #
TR-2 ..... N84-31621 #
TR-5 ..... N84-31304 #
TR-15 ..... N84-31938 #
TR-18 ..... N84-32172 #
TR-19-ONR ..... N84-31305 #
TR-23 ..... N84-31493 #
TR-84-2 ..... N84-31941 #
TR-252-SER-2 ..... N84-32022 #
TR-253-SER-2 ..... N84-32021 #
TR-254-SER-2 ..... N84-32012 #
TR-266-SER-2 ..... N84-32024 #
TR-618 ..... N84-31241 #
TR-680 ..... N84-32127 #
TR-0084(4945-01)-2 ..... N84-31523 #

TVA/OP-EDT-84-25 ..... N84-31541 #

TVA/PUB-84/30 ..... N84-31580 #

UCID-19592-REV-1 ..... N84-31979 #
UCID-19605-84-1 ..... N84-31358 #
UCID-20064 ..... N84-31952 #
UCID-20078 ..... N84-31295 #
UCID-20080 ..... N84-31500 #
UCID-20085 ..... N84-31223 #

UCLA/PPG-784 ..... N84-32196 #

UCRL-TRANS-11970 ..... N84-32195 #
UCRL-TRANS-11972 ..... N84-32194 #

UCRL-15603 ..... N84-31391 #
UCRL-53447 ..... N84-31326 #
UCRL-53468 ..... N84-31354 #
UCRL-53509 ..... N84-31631 #
UCRL-88273 ..... N84-31296 #
UCRL-88711 ..... N84-31496 #
UCRL-89204 ..... N84-31534 #
UCRL-89205 ..... N84-31532 #
UCRL-89724 ..... N84-31578 #
UCRL-89872 ..... N84-31388 #
UCRL-89933 ..... N84-31390 #
UCRL-89966-REV-1 ..... N84-31526 #
UCRL-90334 ..... N84-31627 #
UCRL-90335 ..... N84-31628 #
UCRL-90392 ..... N84-31951 #
UCRL-90449 ..... N84-31571 #
UCRL-90642 ..... N84-31394 #
UCRL-90657 ..... N84-31393 #
UCRL-90706 ..... N84-32146 #
UCRL-90835 ..... N84-31575 #

UDR-TR-82-153 ..... N84-31600 #

UNC/ORSA/TR-84/5 ..... N84-32015 #

UNIDO/IS.440 ..... N84-31986 #

US-PATENT-APPL-SN-500717 ..... N84-31604 #
US-PATENT-APPL-SN-509076 ..... N84-31530 #
US-PATENT-APPL-SN-509554 ..... N84-31602 #
US-PATENT-APPL-SN-512059 ..... N84-31529 #
US-PATENT-APPL-SN-517531 ..... N84-31413 #
US-PATENT-APPL-SN-522282 ..... N84-31603 #
US-PATENT-APPL-SN-523990 ..... N84-31531 #
US-PATENT-APPL-SN-532430 ..... N84-31787 #
US-PATENT-APPL-SN-536059 ..... N84-31526 #
US-PATENT-APPL-SN-596751 ..... N84-31495 #
US-PATENT-APPL-SN-606729 ..... N84-31407 #
US-PATENT-APPL-SN-615413 ..... N84-31408 #
US-PATENT-APPL-SN-616832 ..... N84-31643 #
US-PATENT-APPL-SN-620301 ..... N84-31644 #
US-PATENT-APPL-SN-623883 ..... N84-31601 #

US-PATENT-APPL-513521 ..... N84-31625 #

USAAVSCOM-TR-84-A-1 ..... N84-31554* #
USAAVSCOM-TR-84-C-3 ..... N84-31095* #
USAAVSCOM-TR-84-F-4 ..... N84-31085 #

USAFSAM-TR-84-12 ..... N84-31914 #
USAFSAM-TR-84-17 ..... N84-31912 #
USAFSAM-TR-84-23 ..... N84-31306 #

USCG-D-31-82 ..... N84-31946 #

USGS-OFR-83-455 ..... N84-31854 #

UTEC-ME-84-075 ..... N84-32121* #

UTIAS-TN-255 ..... N84-31563 #

UTIAS-270 ..... N84-31562 #
UTIAS-276 ..... N84-31701 #

UVA-ER-914-84U ..... N84-31573 #

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